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A TREATISE

ON THE

Nature, Economy, and Practical Management,

OF

BEES;

IN WHICH

THE VARIOUS SYSTEMS OF THE BRITISH AND FOREIGN APIARIANS ARE EXAMINED,

AND THE

MOST IMPROVED METHODS LAID DOWN FOR EFFECTUALLY PRESERVING THE

LIVES OF THE BEES.

CONTAINING ALSO,

AN ACCURATE DESCRIPTION, ILLUSTRATED BY PLATES,

OF

THE HIVES,

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ae

INVENTED BY LOMBARD, DUCOUEDIC, HUBER, VICAT, L'ABBÉ DELLA ROCCA, AND OTHER FOREIGN APIARIANS;

AND OF

A NEWLY INVENTED HIVE,

FOR THE PURPOSE OF DEPRIVING THE BEES OF THEIR HONEY, WITH SAFETY AND EXPEDITION:

FORMING

The most complete Guide

TO THE

STUDY AND MANAGEMENT OF THOSE VALUABLE INSECTS.

BY ROBERT HUISH,

AUTHOR OF THE PERUVIANS, A POEM, &c. &c.: FELLOW OF THE ACADEMY OF ARTS AND SCIENCES, OF GOTTINGEN: HONORARY MEMBER OF THE IMPERIAL APIARIAN SOCIETY OF VIENNA: AND CORRESPONDING MEMBER OF THE AGRICULTURAL SOCIETIES OF BAVARIA AND SILESIA.

Admiranda tibi leviam spectacula rerum
Magnanimosque duces, totiusque ex ordine gentis,
Mores et studia et populos et prælia dicam,
In tenui labor, at tenuis non gloria. *Virg. Georg. 4.*

— cc. h. 12

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BARNARD AND FARLEY,
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TO

THE RIGHT HONOURABLE

SIR JOSEPH BANKS, G. C. B.

THE

Patron of the Arts,

WHOSE LIFE

HAS BEEN UNIFORMLY DEVOTED TO THE DIFFUSION

OF

SCIENTIFIC KNOWLEDGE,

AND

TO WHOM

THIS COUNTRY IS INDEBTED

FOR SOME OF THE MOST VALUABLE IMPROVEMENTS

IN EVERY BRANCH

OF

RURAL ECONOMY,

THIS WORK

IS,

BY HIS PERMISSION,

MOST RESPECTFULLY

DEDICATED

BY

THE AUTHOR.

PREFACE.

NOTWITHSTANDING the numerous Works which have appeared in this Country, and in France and Germany in particular, relative to the Management of Bees, still, the foundation stone only may be said to be laid towards an accurate and distinct knowledge of the internal Economy of those surprising Insects. Many prejudices require to be extirpated, and an entirely new feature given to this interesting part of agricultural Science, before those national advantages, with which it is so pregnant, can be derived from it. The Natural History of Bees, and the method of managing them, have, it is true, exercised the skill and ingenuity of both ancient and modern Authors of every class and of every age. Some have applied themselves

principally to the study of their Police, to the investigation of their respective Operations, and to the developement of those Mysteries, which are so essentially connected with their Natural Economy: amongst these, the Ancients certainly claim precedence, who to a few truths joined a considerable number of fabulous stories. Others have only written on Bees, in regard to the manner of rearing them, and to the *plus* or *minus* of Profit to be extracted from them.—If in their Works some Traits of the History of these Insects present themselves, they are confounded with romantic Anecdotes, Prodigies, and Wonders, of which no proof is exhibited, and which never existed, but in the Georgics of Virgil, or in the exuberant imagination of certain Ancients, whose Commentators are merely the echo of an echo. These are the Authors of those numerous little Treatises, the whole merit of which consists often in the repetition of what is generally known, or in the enumeration of certain Experiments or particular Observations on the ordinary method of managing Bees. Certain Authors finally and successfully united Practice and Theory, Truth

and Speculation; but able and skilful as those Authors shewed themselves, they have, owing to an inability of dedicating to that particular Study all the time and application which were requisite, left a number of objects indefinitely explained, which repeated Experiments would have confirmed. M. de Reaumur, in particular, assisted by the Experience of his Predecessors, has brought the Natural History of the Bee to a high state of perfection, or at least as high as could be expected from a Person, whose entire application to that particular branch of Physiology, did not exceed four or five years; but notwithstanding all the light which was cast upon the subject by that able Naturalist, there is an obscurity thrown over certain parts, and a Vacuum observed in regard to certain Minutiæ, the repletion of which gave ample scope to the skill and perseverance of his Successors. Reaumur is very defective in the precepts which he lays down for the practical Management of Bees; and it is on this particular point in which (I may almost call it) a culpable ignorance prevails in this Country. Notwithstanding the laudable

efforts of many Individuals, and the Premiums offered by many of our Agricultural Societies, the Culture of the Bee is most glaringly neglected, as if neither profit nor advantage were to be derived from it. What is begun by Ignorance is completed by Superstition, and it is an anomaly in the History of the most enlightened People of the world, that a considerable national advantage is entirely lost by the blasting influence of Superstition. I can affirm, that I know a number of Persons who would keep Bees, provided they could have a Stock *given* to them; but who, were they to purchase it, would consider their Money fruitlessly expended, owing to the ridiculous prejudice, that a purchased Hive never prospers. It was this circumstance that first gave rise to the idea in my mind of establishing an Apiarian Society, for the purpose of giving Hives to those prejudiced Persons, and in return obliging them to dispose of the Produce of their Apiaries to the Society alone, and in a given time to repay the Hive or Hives, with which they had been originally furnished; or the Plan of the Apiarian Society of Vienna might have been adopted, of

having general Apiaries in different Districts, which are placed under the superintendance of a skilful Person, and in which the Peasants have the liberty of depositing their Hives, on paying a small Sum towards the Expence of the Establishment. Excepting the Spanish, I know of no Nation which entertains such superstitious prejudices, in regard to Bees, as the English. It will hardly be credited, that in some parts of England the Bees are not permitted to leave the Hive on a Friday, and this is founded on a religious scruple;—can it then be expected that the Culture of the Bee can flourish, or be augmented in a Country where such deplorable prejudices exist? It is not however verbal nor written Instruction which can remedy those evils; the cure must be effected by the powerful influence of example, and the obstinate and prejudiced Cottager must be led to actual truth by a perspicuous display of practical Science.

If we take a view of the modern Authors, with the exception of Bonner, we shall find their Works burthened with Precepts, difficult,

if not impossible in the execution, and which tend rather to instil a dislike and aversion to the Culture of the Bee, than a desire to promote it. Hypothesis has been heaped upon Hypothesis, and the ebullitions of fancy have been taken for the sober dictates of truth. It is only from the Authors of this Country, or of France or Germany, that any expectation can be formed of the impediments being removed, which at present throw such a chilling influence over an extended Culture of the Bee. In Italy, the People appear to be wrapped in the darkest veil of ignorance on every point connected with Bees; and excepting the Work of Joseph Falchini, printed at Florence in 1747, and that of Jerome Maroni, printed at Verona in 1761, both of which are filled with mythological fooleries, the Italians are wholly destitute of any practical Treatise, by which Apiarian Science can be extended, and in the present degraded state of Literature and the Arts in that Country, no rational hope of an improvement can be founded.

In regard to the Work now offered to the

Public, any Eulogium on my part would be indecorous. My aim has been to simplify the mechanical Operations of the Apiary, to stimulate those who are already engaged in the Culture of the Bee to greater exertions, and to induce others to undertake it, from a full exposure of the great advantages to be derived from it, not only in an individual but national point of view; and finally, to render this Country independent of all foreign supply of the Produce of the Bee.

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. . . . . The Bee observe,
She too an artist is, and laughs at man,
Who calls on rules the sightly hexagon
With truth to form; a cunning architect,
That at the roof begins her golden work,
And builds without foundation. How she toils!
And still from bud to bud, from flow'r to flow'r,
Travels the live-long day. Ye idle drones,
That rather pilfer than your bread obtain
By honest means, like these, look here and learn
How good, how fair, how honourable 'tis
To live by industry! The busy tribes
Of Bees so emulous are daily fed
With heaven's peculiar manna. 'Tis for them,
Unwearied alchymists, the blooming world
Nectareous gold distils; and bounteous Heaven
Still to the diligent and active good
Their very labour makes the certain cause
Of future wealth.

INTRODUCTION.

IF we take a retrospective view of the apiarian knowledge of the ancients, as far back as Democritus, who lived four hundred and sixty years before the Christian era, we shall find that they occupied themselves more with the Natural History of the Bee than with its economy. The major part of their writings is lost, and the traces of them are only to be found in two works of the seventeenth century; the author of which is Alexander De Montfort, Captain in the service of his Imperial and Catholic Majesty, and who was born in the country of Luxemburg.

One of these works is entitled, "*The Portrait of the Honey Fly; its Virtues, Form, and Instructions how to reap Advantage from them.*" Printed in 1646; the other, printed in Antwerp, in 1649, and entitled, "*The Spring of the Honey Fly, divided into two Parts, in which will be found a curious, true, and new History of the admirable and natural Conduct of the Bee, drawn solely from the Hand of Experience.*"

De Montfort estimates the number of authors who wrote upon Bees, before his time, at five or six hun-

dred; and he quotes a few, such as Galen, Aristeus, Aristomachus, Menus, Misald, Philistrius, Solin, John of Lebanon, &c. &c., whose works, however, on that subject, are wholly unknown to us. He, however, cites a few with whose works we are conversant; viz. Aristotle, Columella, Varro, Moufet,* Aldrovandus,† &c. &c.

The writings of De Montfort are valuable, on account of their uniting the reveries of the ancients, with some weak scintillations of modern knowledge. Some of the ancients imagined that the Bees were bred from the purest juice, which could be extracted from the flowers in summer; others conceived, that they were bred from putrid animals. They were acquainted with the existence of one superior Bee, whom they called the King, and who was supposed to originate from a flower, or an animal, more distinguished and noble than that from which the common Bees originated. They regarded the drones, or males, as idle lazy flies, of no particular use, and even noxious, and only fit to be exterminated. They called them hornets, or *flies of an ugly shape.* When they saw two Queens in a swarm, they believed that one of them was a false King, or a Tyrant; they therefore called him the *usurping Prince, who plays on the*

* Thomas Moufet, an English Physician, who died about 1600, known by a work written in Latin, entitled, *Theatrum Insectorum*, Loudini, 1634, in fol. with plates.

† A celebrated professor of physic, at Bologna; one of the many authors whose labours have been most extensive in natural history. His works are almost incredible; they are contained in thirty volumes, in folio. They did not however enrich him, for he died blind in the hospital at Bologna, at the age of eighty.

flute to divert the Bees: all due homage was however paid to him.

De Montfort, and his predecessors, attributed to the Bees a skill in architecture, which surpasses that of Archimedes.* They endowed them with foresight; they spoke of their science in mathematics, in arithmetic, geometry, astrology, logic, philosophy, painting, poetry, music, pharmacy, medicine, chemistry, &c.†

In medicine, for example, Bees pounded, and taken in a beverage, assuaged the maladies of the stomach, and of vomiting; they cured the dysentery, and diminished the freckles in the face; incorporated with nut-oil they restored lost hair. Honey was an universal remedy; it dissipated melancholy, anger, corrupted blood; it assisted those who had short breath, inveterate cough, pain in the side, sciatica, gout, flatulency; it assuaged the troubles of mind, restored the health impaired by age, hunger, or sickness, &c. &c.

Among the authors quoted by De Montfort, Moufet deserves particular notice. "He says, "that the "Bee breeds by copulation; that the male and fe- "male search for each other in the woods, in a place "so very retired, that no person has ever yet seen "them." De Montfort calls this a bold conjecture, and which is not founded on any demonstration, nor experience. This circumstance would not have been

* Virgil says that a Bee is a ray of the divinity; Plutarch, that it is the magazine of virtues; Quintilian, that it is chief of geometricians.

† V. le Portrait de la Mouche a miel, ses vertus, forme, sens et instruction par A. de Montfort, Liege, 1646.

mentioned, had it not been that some apiarians of the present day* entertain the same opinion, although they cannot produce a single fact to establish their doctrine.

Those who in the seventeenth, and at the commencement of the eighteenth century, wrote after De Montfort, have repeated his reveries, and have taken possession of his engraving: it is to be seen in the eleventh edition of his *Maison Rustique*. It is that, in which there is a figure of a man, who attempts to put a swarm into a sack.

On finishing with the ancients, I cannot refrain from quoting Plato, who said that the Bee has some spark of the celestial anger, which animates the poets; in consequence of which, he advises his disciples, who wish to preserve their repose, not to irritate either the Bees, or the poets.

At the close of the seventeenth century, three celebrated naturalists appeared: Swammerdam, a Dutch physician; Maraldi, an astronomer, and member of the Academy of Sciences; and Ferchault de Reaumur, also a member of the Academy of Sciences, who, by their observations and dissections, began to raise the veil which concealed from us a great part of the natural history of the Bee. They discovered that there were males and females amongst the Bees, and from that period the idea, and the conjecture of De Montfort ceased to be considered so hardy. The writings and experiments of these three learned men made a total change in the appellations respecting the Bees: and their works were translated into every language.

* Huber, Lombard, and others.

Among those who in later times have written upon Bees, may be distinguished particularly (1) Schirach, who discovered that the Bees, who have lost their Queen, can raise another for themselves from maggots of their own kind, by giving them a particular nourishment; (2) Riems, who discovered that there are common Bees which lay eggs; (3) De Braw, who attempted to establish, by experiments and specious arguments, that the eggs which the Queen lays are fecundated by the drones in the manner of fish; and, lastly, Butler, who attributed a song to Bees.* The points rendered clear by these writers were, that amongst the Bees there were male and female, and no neuter, without being able at the same time to tell us, in what manner the Queen Bee was fecundated. Reaumur alone believed that he had witnessed the fact, without avowing it positively.

This is the second epoch of the natural history of the Bee.

At the close of the eighteenth century, M. Huber, a blind naturalist appeared, who directed his servant, François Beurnens, with so much sagacity, that, after a multitude of experiments, the following are the results; and which are merely quoted to shew how far the folly of a man can extend, who wishes to be the founder of a system. A smile will no doubt sit upon the countenance of every one in the least conversant with Bees, when he reads the following wonderful discoveries of M. Huber; and his surprise will also

* To quote all the writers upon Bees would be a most superfluous task: their various theories will, however, be investigated in the course of the present work.

be great when he finds, that such a wild and incoherent system has its advocates and defenders amongst men, whose science and general knowledge should have protected them from giving any support to such gross absurdities. The following are a few of the discoveries of M. Huber:

1st. That the Queen Bee is not fecundated in the hive, but in the open air; and this was conjectured by Moufet some centuries back. Mr. Lombard, a French apiarian, gravely informs us that this discovery consequently destroys the system of De Braw.

2d. That the pollen, which until his time was known by the name of *crude wax*, is not the raw material of the wax, and that it is the nourishment of the Bees in their earliest stage.

3d. That it is the saccharine part of the honey which produces the wax in the bodies of the Bees, which they even extract from sugar.*

4th. *That the young Queens make such a clapping noise as to strike the Bees immovable.*

As however the absurdities of M. Huber will be often reverted to in the course of the present work, they shall not in this place be further enlarged upon.

In regard to our English apiarians, very little has been done by them towards the establishment of a perfect knowledge of the Bee. Bonner, a Scotchman, was certainly a good practical apiarian, but he was, unfortunately, beset with most of the prejudices of the more ancient authors. He took Schirach for his guide,

* This is the general opinion of the foreign apiarians, from L'Abbé della Rocca to Mr. Ducouedic. It has, however, been successfully combated by Duchet, Ducarne, and others.

and by thus acting he fell into the glaring errors and inconsistencies of that naturalist. He is one of those apiarians who pretend to have actually *viewed* the operations of the Bees; but, although I here acknowledge to have gained much valuable information from his conversation, yet I have sacrificed many hives at his suggestion, in hopes of discovering the deep secrets of these winged freemasons; and the only result was the murder of a few thousands of my favourites. He has, however, in one respect been a benefactor to his country; he implanted a desire in his countrymen to cultivate the Bee, and many are now ready to acknowledge, with gratitude, the advantage which they have derived from his counsel. I shall feel myself happy if the end of my labours be the same.

A

PRACTICAL TREATISE

ON

BEES.

CHAP. I.

ON BEES IN GENERAL.

I SHALL not here give a description of all the different species of Bees, which the Author of Nature has disseminated throughout Creation; the only question is of those which we cultivate, and the produce of which forms one of the principal branches of our rural economy; the others belong more properly to their natural history, which has already been ably treated by Reaumur and other skilful naturalists.

The common Bee, or Honey Fly (Apis), is an insect of the species of the fly with four wings. This fly is of the number of those who live in association. Man has subjected them to his dominion, in order to profit by their labours; and he has assembled them

in kinds of baskets or boxes, called Hives, which vary in form and size in different countries.

The order which reigns in the different functions of the domestic Bees, their mode of government, their industry, the exquisite art manifested in their works, and the great utility of their labours, have attracted towards them the attention of ancient and modern philosophers, some of whom have passed the major part of their lives in the study and contemplation of those wonderful insects. Some individuals, however, allowing themselves to be carried away by enthusiasm, have attributed almost miracles to them; and in this class, Bonner certainly holds the first rank. In the earlier period of the history of the Bee, Swammerdam, Maraldi, and Reaumur, certainly divested their history of much that was marvellous and ridiculous, and they rendered the study of it more interesting, by the certainty of many truths, which they announced; and by a multitude of new and various particularities, which came under their immediate observation. But in the vast field which they have traversed, notwithstanding the abundance of their harvest, there yet remains much to glean. Since their time, science has been gradually unlocking her stores, and the mists of prejudice have been dispersed by the penetrating rays of philosophy. The treasures of Nature are inexhaustible, and there is certainly no department in her vast domain, in which curiosity and amusement are more intimately blended, than in the study of the Bee.

There is no doubt that there are various species of the working Bee; some large, and some small. The latter is always to be preferred. The Abbé

Rosier, one of the best-informed of the French agronomes, particularizes four species of domestic Bees, with which it is essential to be well acquainted, as they differ much in their good qualities. Those of the first species are large, long, and very brown; those of the second are not so great, their colour is almost black; those of the third are grey; and of a less size; those of the fourth are much smaller than the two former, of a bright yellow, shining, and polished. The latter are called, in France, the *Little Dutchmen*, or the *Little Flemings*, because they are the only sort which are bred in Holland or Flanders.

The Bee is the most active and the most industrious of all insects. It works from the very first ray of day to the twilight, in those countries in which there is a perpetual Spring. In the Southern Countries, it is occupied during nine months; there is even in the Winter but a few days in which it appears to repose. It is only in the more Northern Countries that the Bee ceases absolutely to collect its sweets, from the latter end of September until the return of Spring.

It is to this insect, and to this only, that we are indebted in Europe for the honey, and the wax, which form an important branch of our rural economy; it gathers the substances which form the composition of honey, from the majority of the plants, from the loftiest tree to the most humble of the shrubs and simples. The forests and the heaths belong equally to its domain.

Indeed, during the time of the rising of the sap, all the vegetables are full of nutritious juices, which

are laid under contribution by the Bee, whose only embarrassment is in the selection. Independently of the juice of the plants, and the nectar of the flowers, which it extracts from their chalices, without tarnishing their purity, and with an art which is derivable solely from nature, it is often observed to be busily occupied with bark and moss of trees, on which its piercing eye, and penetrating sense and smell, have enabled it to discover those substances which are necessary to the completion of its mellifluous store: it is sometimes seen on rocks, and on walls, the stones of which appear to be completely bare. This insect appears to collect salts, which are wholly imperceptible to us. Water is actually necessary to it, and its instinct enables it to discover springs, which to us are unknown.

The Bee is particularly delighted in roaming from flower to flower; and if it does not insert its whole body into each, it at least introduces its proboscis into the chalices. It enriches itself from every flower, and the attentive eye of the observer, who watches its motions, perceives the growth of the pellets of pollen, or farina, with which it furnishes the cavities of its hinder legs. But the eye cannot perceive any alteration in the flowers; they have not lost any thing of their beauty, nor of their colours, nor of their faculty of fructification; on the contrary, it is to the Bee that the seminal matter of the male flower is conveyed to the female, as in cucumbers, melons, currants, gooseberries, &c.

In this kingdom there are many hundreds of hives, and, in every species of our harvests, we do not miss a single particle by the labour of these insects, or by

the transportation of those substances which are necessary to them.

During the summer, to whatever quarter the Bee directs its flight, it is certain of a greater or less harvest of those substances which are proper for its habitation and support. With these substances imbibed into the stomach, or fixed to its thighs, back, or wings, it continues its flight in search of more food, and such is its indefatigability and ardour, that it prolongs its flight, until its load be perfectly complete, with which it returns to the hive.

Immediately on its arrival, it hastens to a cell, and evacuates from its stomach the substance which is converted into honey, or it is assisted by the other Bees in discharging from its thighs the load of farina which it has collected in its journey. It is no sooner unburthened of its treasure, than it prepares for a fresh flight, cleans its wings, refreshes its antillæ, and in an instant darts from the hive to the fields of its harvest.

The Bees live in a state of society; the individuals of a hive are perfectly known to each other, and they never admit a stranger into their community, excepting accidentally at swarming time, when circumstances can so combine, that several swarms may unite, and form a social brotherhood. Every society is a monarchy governed by a Queen, subordinate to whom are several hundred drones, and a multitude of labourers, according to the size of the colony.

All the working Bees are armed with a sting for their defence, which is placed at the posterior extremity of their body, but as soon as it has been used it is left in the wound that has been made and the Bee

perishes: the injury, which is occasioned by the eruption of the intestines, to which the sting is affixed, is always mortal.

The Bees in general know the persons who are accustomed to work in the apiary, and they seldom attack them. It is however singular, that they entertain a particular dislike to certain persons, and I once conceived that it might arise from the colour of the dress, knowing that they have an antipathy to particular colours; but I tried the experiment of dressing a person, to whom, on his approach to my apiary, the Bees testified a dislike, in different colours, and the result was always the same. He no sooner came, as it may be called within the range of the Bees, than he was instantly attacked, and obliged to make a precipitate retreat. On the whole, the Bee is a very bold and irascible insect. It knows all the variations of the atmosphere, and it seldom quits the hive if the weather be uncertain. When they are overtaken by a storm, they shelter themselves under the branches and the leaves of the trees.

The ancients were not ignorant of the great attachment which the Bees entertain for their Queen, whom they knew by no other title than that of King. Varro informs us, that they are constantly occupied in providing for her preservation; that they animate her in her flight, even to the length of carrying her, if she appears to them to be too much fatigued.

The extent of the life of these insects has not yet been ascertained, and it is one of those events in nature, to the certainty of which we can never attain. Few however die of old age, in comparison with those who perish by the violence of the tempests, by birds,

wasps, fieldmice, toads, and a whole host of other enemies. The dysentery is the only serious malady which is known amongst them, and with which whole colonies are sometimes infected. A singular strictness however prevails toward all those who have been so unfortunate as to lose a wing, a leg, the proboscis, or any other part; they are without any mercy banished from the hive, in which no infirm members are allowed, and they then fall victims to the voracity of other insects or birds.

Their cleanliness in the interior of the hive is most extraordinary: if a Bee dies in it, it is immediately dragged from the hive, as well as all the deceased embryos. They clean all the cells, in which the Queen has laid her eggs, and as soon as a young Bee emerges from its cell, it becomes the operation of several of the old Bees to clean it.

Every Bee, immediately on quitting its nymphal state, knows its particular department of labour. There is never the least disorder nor confusion amongst them, neither in entering nor leaving the hive, nor in their labours, nor when the inclemency of the weather prevents them from going into the fields. Every one knows its duty, with an instinct more admirable than it is easy to conceive. The prodigies of nature are wonderful in these insects. They are born, and without any subsequent instructions perform their proper labours, either in collecting the substances which are useful, and necessary to the fabrication of honey, wax, or propolis, according to the respective wants of the colony.

How shall we account for that certain and ready manner in which the Bees know their own hive from

a hundred others, and all of which have in their exterior form a perfect resemblance to each other? It is in this point of view that Nature appears in her greatest power, and the hand of the Great Being, who gives to the meanest reptile, the instinct necessary for its preservation, is visible and demonstrative. The existence and conduct of these insects in their government present a series of phenomena which are peculiarly interesting and instructive to persons curious in the prodigies of nature.

CHAP. II.

DESCRIPTION OF THE QUEEN BEE.

THE Queen, or Mother Bee, holds the first rank in the colony. She is the mother of all the young Queens, Drones, and Working Bees; in fine, of the whole family, who emigrate from an old hive to create a new establishment, and to form for themselves a colony in another place.

The make of this wonderful insect is wholly different from that of the other Bees. Like the Drones, she has no triangular cavities in her hinder legs, which are appropriated, in the common Bee, to the reception of the farina of plants. Her teeth are smaller than those of the common Bee, but larger than those of the Drones, and she has no brushy substances at the end of her feet. The Queen in her body is longer and more taper than the Drone, but the most certain characteristic of the Queen Bee is the shortness of her wings, which only extend to the third ring of her body, whilst the wings of the working Bees, and especially those of the Drones, extend the whole length of the body. (See Plate I.

Fig. 1.) With these short wings, the Queen flies with greater difficulty than the working Bees; and indeed, during her life, it seldom happens that she has any occasion for them. The belly of the Queen is of a golden colour, and the upper part of her body is of a brighter hue than that of the common Bee. In the interior of her body the eggs are distributed in two ovaria; each ovarium is an assemblage of vessels, which terminate in a common channel; and which are all filled with eggs during the breeding season.

The Queen is of an astonishing fecundity, and which is not to be equalled by any other insect, nor animal. Fish, indeed, may form an exception. The Queen Bee lays her eggs, as long as there is a cell, in which to deposit them; and the question now to be decided is, in what manner, and at what time, are the eggs fecundated? On this subject various and contradictory have been the opinions, and hypotheses, of apiarians. Some of the most extravagant systems have been adopted, and the whole force of human sagacity and invention has been called in to discover this great secret in the works of nature; but after all these exertions, the same doubt exists as at the commencement of the investigation. The English apiarians, Thirley, Varder, Wildman, Bonner, Keys, &c. have each had his respective system, and each believed, that he was the fortunate discoverer of the secret. The latter apiarian confined a Drone and a Queen, under a tumbler, and wonderful to relate! he *saw* the Queen court the Drone, but in what manner the courtship was performed, he omits to state. The Drone is, however, stated to have shewn

a total indifference to the libidinous gestures of her majesty, and my surprise would have been great had it been otherwise. I acknowledge, however, that Bonner and myself once tried this experiment together, and so far from observing any wanton gestures on the part of the Queen, her whole desire seemed to be, to escape from her intended paramour. The French apiarians have studied this matter more scientifically and profoundly, but in some of their systems, the greatest inconsistency and improbability prevail. It was the opinion of M. Huber, and after him of Bosc, Féburier, Lombard, and others, that the Queen Bee is fecundated in the open air by some favourite Drone, who, leaving the hive for that purpose, retires to some sequestered spot in the woods. I give these gentlemen some credit, for the great modesty with which they have adorned the character of the Queen Bee, making it shameful for her to undergo the act of copulation in the presence of so many of her subjects. A moment's consideration must, however, shew to those able apiarians the fallacy of their hypothesis; for nature herself would be abused in having created 1000 or 1200 Drones, and that *one* only should be thought necessary for the purpose of propagating the species. The absurdity of this opinion is, however, manifest by the following position. We will grant that the eggs existing in the ovarium of the Queen Bee are fecundated by a single act of coition, as it is asserted by Huber and others, but how are the eggs then fecundated, which did not exist in the ovarium at that particular period? Another favourite Drone

must be then selected, and retire to the woods—but this would invalidate the whole system of these apiarians, and perhaps the reason why the Queen and the Drone, under Mr. Keys's tumbler, did not gratify him with a view of their secret operations, was, in the first instance, that the place was too public, and in the second, that he had not selected a favourite Drone.

Others report that the Queen is the concubine of 1000 or 1200 Drones, and that she yields to their embraces by turns. This is running into the other extreme, and I am convinced, that were this the established system, the hive would be one scene of war and strife. The ten years war of Troy for a strumpet, would be a mere bagatelle to it, and certainly no more terrible situation could be presented to the view of some future Homer, than a Queen of the Bees hunted about by 1200 sturdy Drones, each burning with desire to possess her; but perhaps Mr. Keys, and the other apiarians, who are the advocates of the above system, endow the Drone with a placid, patient, and accommodating temper, and that he never interferes with the embraces of the Queen, until it comes to his turn. There must be some mechanical regulation of this sort, or we should tremble for the life of the Queen. On this subject, M. Lombard says, "In the hive, the Drones testify a perfect indifference towards their Queen;"—admirable order!!—"for were it otherwise, there being at one time of the year from 1500 to 2000 Drones, the Queen would have no repose; all would be hastening to enjoy her, and she would not find time to eat, nor to lay her eggs; her rencontre and copulation with the

Drone take place exterior to the hive, and whilst they are on the wing.* It is similarly constituted with the whole family of flies."

Now considering the vast extent of the air, I rather conceive that the chances are 1000 to 1, that the Queen does not fall in with a drone on the wing, and that she might hunt about the whole day and not gratify her propensities; and comparatively speaking, the Drones might be equally unfortunate, and thus the propagation of the species would stand still. There is, however, no difficulty which the founder of a system will not surmount, in order to establish it; and M. Huber, therefore, solves the above difficulty in the following manner. In his first letter to M. Bonnet, he says,—"The naturalists have been always very much embarrassed to account for the number of Drones, which are found in the majority of hives, and which seem like a dead weight on the community of the Bees, *as they do not perform any function in the hives.* At the present day, however, the intention of nature in multiplying them to such an amount, may be ascertained; because, as the fecundation cannot take place in the hive, and the Queen is consequently to fly in the open air to find a male, who can fecundate her, it is necessary that

* Scopoli, a German apiarian, whose work on Bees is written in Latin, and translated by Meidinger, with a view to ascertain the truth or falsity of the Queen being fecundated in the open air, cut the wings of the Queen at the commencement of the spring, and in the autumn he found the same Queen in the hive. Two excellent swarms had been obtained during the summer, and although he is no advocate for the system of the copulation of the Drone with the Queen in the hive, the above experiment convinced him, that it did not take place in the open air.

these males should be so numerous, that the Queen may not find a great difficulty in meeting with one; if there were only one or two Drones in a hive, the probability would be very small that they would leave the hive at the same time as the Queen, and that they would meet in their excursions; consequently the majority of the Queens would be barren. Consistently with the order of nature, the young Queens ought to receive the male from the sixteenth to the twentieth day after their emancipation from the cell. A single coition fecundates them *for two years at least.* Forty-six hours after coition, the Queens begin to lay their eggs, from which the working Bees are to issue. The period of laying these eggs lasts eleven months, including the time that it is suspended by the frost; it is always proportionate, as has been observed, to the subsistence, which the Bees can find in the fields. About the eleventh month, which in our climate arrives in March or April, the Queens, heavy and big, begin to lay the male eggs; twenty days afterwards, the working Bees construct the royal cells, in which the Queens, without discontinuing the laying of the male eggs, deposit at the interval of one, two, or three days, those eggs from which the Queens are successively to spring."

In this manner have M. Huber, and his adherents, accounted for the multitude of Drones in a hive, not wishing to commit high treason against nature, by establishing the creation of a number of useless creatures, and yet how inconsistent with common reason is such a system! and how contradictory to the daily experience of the attentive apiarian. It is an acknowledged fact that the Queen Bee never leaves

the hive, on any account whatsoever; and it is surprising that apiarians of the celebrity of Huber, and some of his adherents, should not have tried the experiment of taking the Queen Bee from a hive, and keeping her a prisoner for some hours, when it might be supposed by her subjects, that she was gone to meet her paramours in the woods, and they would soon find that disorder and confusion in the hive, which are always the consequence of the absence or loss of the Queen. For as it must be supposed, that the Queen may have some difficulty in meeting with a Drone, her time of absence from the hive must be indefinite, and the only method by which M. Huber can extricate himself from this dilemma, is to invent some sort of language by which the Queen can make known to her subjects the cause of her absence, nor would this invention be difficult to M. Huber, seeing that he has invested the Queen with the particular and miraculous power of clapping or chattering so as to deprive all the Bees of motion.* We will, therefore ourselves, assist M. Huber, and his admiring adherent M. Lombard, from this dilemma, and suppose, that whenever the Queen goes to the woods she previously makes that chattering noise, by which her subjects are rendered senseless until her return. We confess, however, that we have never witnessed, during twenty years experience, one single instance of the Queen ever exercising that power, and therefore take it for granted that it does not exist.

Having, I hope, now successfully refuted the

* The credit of this discovery is not due, however, to M. Huber, as it is mentioned both by Riems and Schirach.

hypothesis to the coition of the Queen exterior to the hive, I have three other methods to examine, and each of which has had, and still finds its adherents. The former is, that she has the power of self impregnation, and this opinion was at one time held by Bonner. There is no doubt, that it originated in the difficulty of solving those paradoxes, which naturally present themselves in the elucidation of the manner, by which the Bee is propagated. This hypothesis was, however, soon exploded, as it contained a principle revolting to the general and uniform operations of nature, and of which no instance can be found even in the vegetable kingdom, much less in the animal one.*

* The existence of Androgynes is, however, thought by some to be unequivocally established, and Reaumur, and Bonnet, of Geneva, the able correspondent of Huber, have verified the fact. On the subject of those insects, from whose excrement the Bees collect a considerable quantity of honey, and which has been so fully discussed by M. Boissier de Sauvages, (See chap. 14, p. 127). M. Bonnet says,

" La race puceronne se reproduit non seulement en suite de l'accouplement entre les deux sexes; mais ce qui dut alors bien étonner, les femelles deviennent fécondes sans avoir eu, pendant plusieurs générations de mère enfille (car il faut ici changer les expressions vulgaires) sans avoir eu, la compagnie du mâle. Ce sont de vrais androgynes; et ils le sont beaucoup plus que les limaçons,* qui ayant chacun les deux sexes à la fois, ne laissent cependant pas de s'accoupler réciproquement, et comme si ce n'était pas avoir déjà poussé la singularité assez loin, il semble qu'il soit indifférent à nos pucerons d'être ovipares comme les oiseaux, ou vivipares comme les quadrupèdes. Ils pondent des œufs dans un saison, et mettent bas des petits dans une autre."

* I am surprised at this assertion being made by so great a naturalist as Bonnet; the sexes are as distinct in the snails, as in any other insect or animal. Their system of copulation cannot have escaped the notice of Bonnet; and, therefore, neither the snail nor the slug can be classed as hermaphrodites.

The next method is the copulation of the Queen with the drone in the hive.* From the reasons already stated, this system carries with it an impracticability. It is, however, astonishing to what length the fancy of individuals will go towards the establishment of a system, the premises of which have not the slightest foundation, neither in truth nor experience. An apiarian at Billericay, in Essex, has lately submitted two theories to the consideration of naturalists, but which are in direct contradiction to the actual and repeated experience of the most able, and indefatigable apiarians. He says, the natural history of the Bee, as it is at present understood, is erroneous, as being contrary to the laws of nature. Is he then so well versed in the operations and the laws of nature, as to determine their truth, or fallacy, according to their effect upon his limited capacity? Is he to fix a limit to the boundless and varied power of nature, and to denounce an effect as contrary to it, because it does not exactly coincide with his notion of the way in which nature ought to work? Can he condemn an effect as erroneous, being ignorant of the extent of the powers of the acting cause? The plant is very different from the seed from which it sprung. The silk worm, after having enclosed itself in its cocoon, becomes a chrysalis, and in the space of twenty-one days, emerges a beautiful moth. How has this

* Lûttichau, a German apiarian, doubts the act of copulation taking place in the air, although he has some reason to suppose that it does happen; but he asserts, with the greatest confidence, that he has actually viewed it in the hive, and that he once stuck the Queen with a needle during the act of coition, and on examination he found the organ of generation of the drone in the Queen. *Oh! jam satis est.*

metamorphosis taken place? by what operation of nature has it been effected? man knows not; he can only wonder and admire.

The first theory of the Essex naturalist is almost too absurd to merit any attention; and should these animadversions meet his eye, he must forgive me for flogging him a little with the lash of ridicule. A theory is often the road to truth; but when it is advanced in full contradiction to repeated observation, and in open defiance of acknowledged facts, it must be regarded with the same insignificance as Smith's Theory of a Sun of Ice. If ever a naturalist committed high treason against royalty, the Billericay apiarian must be deemed guilty of it: he has made the Queen of the Bees the rankest harlot which Babylon, or even London ever produced, and that is certainly not saying a little. He makes her first cohabit in a lawful and decorous manner with a King* (which, *en passant*, is a creature entirely of his own creation) for the purpose of producing a royal family, which, being engendered, begot, and reared in the royal palaces, she then (libidinous wretch!) yields herself up to the embraces of 4000 drones, for the purpose of begetting their like; which, being completed, she—I blush to tell the sequel—is attacked by 16,000 plebeian subjects in the full *furor amoris*, whose em-

* Although the natives of the Levant are persuaded that the chief of the Bees is the mother of all the working Bees, they still call it *Ighemonas*, i. e. prince, or conductor. It is not uncommon amongst men to give masculine names to women, who occupy particular situations, or who fulfil those offices which are in general sustained by men. Thus the Hungarians, in their promises to support their monarch, say, *Moriamur pro rege nostro Maria Theresia.*

braces she receives with all possible gentleness and condescension. What confusion, what rioting, must take place in the hive for precedence! the thundering legion of the Romans, in its fiercest attack, must have been a mere farce to it. But we have yet to notice a discovery which will confer immortal honour on the Billericay theorist, and which would never have entered into our dull, barren, and uncreative pericraniums. He has discovered that the drones and the common Bees, in order to effect their infamous and lustful designs upon the Queen, *must be males.* The thanks of every apiarian in the kingdom are due to him. The Royal Society (and at the next meeting we will certainly propose it) ought to adjudge him the silver medal. But his charges against this w——e of a Queen are not confined to her unbounded lust: to heighten the infamy of her character, he makes her a regicide and a murderer; and that, after the King and the 4000 drones have done their utmost to gratify her insatiable passions, she institutes a revolution in her empire, and instigates her 16,000 scavengers and labourers to murder the King and noblesse; for we take it for granted, that the noblesse are drones in every society, let it be apiarian or human.

We have now described the first theory; let us proceed to the description of the second.

How great must be the happiness of the grand seignior seated in his seraglio, surrounded by the most captivating beauties, and each longing with hope to receive from him the well known signal. But poor and trifling must be the happiness of the Turk, in comparison to that of the King of the Bees, who, like

Solomon, has 20,000 females waiting on his pleasure. Thus the Billericay theorist describes the court of the King of the Bees:—In the first place he has a Queen, whom he condescends primarily to fructify; he then launches forth amongst the drones, *alias* the noblesse, and fructifies 4000 of them. Most potent and powerful King!! He now dashes amongst the plebeians, and fructifies 16,000 demireps. He then murders his Queen and the noblesse, and passes the remainder of the year in sensual enjoyment with the swinish multitude.

These are the theories of the Billericay apiarian, and from many such theories may Heaven defend us. They are only proper to be placed in the same scale with some of the wildest hypotheses of the ancients, who considered that Bees were engendered from putrid carcases; and they only merit attention for the purpose of exposing their absurdity, and of establishing a system more consonant to reason and experience.

The fact is, that the Queen knows not coition; she is both virgin and mother, although this is denied by Reaumur and other modern apiarians against the opinion of Maraldi, Swammerdam, and other celebrated naturalists.

In regard to the copulation of the Queen L'Abbé della Rocca says, "Leur derrière est souvent courbé "en dessous; *c'est leur situation ordinaire dans l'accou-* "*plement; elles montent sur le dos du male.*" Solomon says, that there is nothing new under the sun; it may, however, be positively asserted, that it would be something very new in the operations of nature to observe the female *monter sur le dos du male* for the

purpose of procreation. I regret that, considering the manifold obligations which the apiarians owe to L'Abbé della Rocca, that my first mention of him should be derogatory to him, in the character of a naturalist; but, I believe, he may with great propriety be denominated the reversor of nature, in placing the Queen on the back of the drone.

Pliny says, that the King of the Bees has no sting: it is, however certain, that the Queen has one, but she seldom makes use of it. On this circumstance is founded the answer which was made to Urban VIII. after his promotion. On his arms he bore three bees of gold, on an azure field. Having attained to the papal chair, a Frenchman, who regarded him as more attached to his nation than to the Spanish, composed this Latin verse:

Gallis mella dabunt, Hispanis spicula figunt.

To which a Spaniard made the following answer:

Spicula si figant, emorientur apes.

The Pope was afterwards made to answer in a very ingenious manner, and perfectly consistent with his office, as the common father of the Christians:

Cunctis mella dabunt, et nullis spicula figant:
Spicula rex, et enim figere nescit apum.

Louis XII. on entering into Genoa appeared with a coat studded with a swarm of golden bees, in the middle of which was the king, with this inscription: *Rex non utitur aculeo*, which was for the purpose of making known to the Genoese, that he pardoned their rebellion.

The sting of the Queen Bee is bent, and it penetrates to a considerable depth. A French naturalist, M. La Grenée, says, "that he held a Queen Bee in his hand for some length of time, and even tormented her, without having had the honour of being stung." In regard to myself I have experienced that honour in retaining a Queen in my hand, and pressing her closely; although I must confess that the sting was slight, and not accompanied with much pain.

This indolence, or reluctance, on the part of the Queen to revenge an affront, which does not display itself in the common Bee, arises entirely from a consciousness, which she possesses, of the welfare of the hive entirely depending on her preservation: the republic would be exposed to very frequent and alarming danger, if she were addicted to the ebullitions of passion with the same readiness as the common Bee. The Queen Bee is the soul of the hive; if she perishes the labours of the colony cease, and the Bees immediately forsake their domicile. This is another very cogent reason why she is not fructified *à la Huber*; for were she in the habit of leaving the hive for the purpose of copulation with the drones, she would have to encounter such a host of enemies, who are ever on the watch for the Bees, that no insurance-office could be found which would underwrite a policy for her life.

The attachment of the Bees to the Queen is equal to the utility which she is of to their welfare, and the power which she possesses is only employed to the benefit of her subjects. Without her, the species would disperse and be annihilated; without her, or at least without the hope of another being soon born, every

thing is in languor, dejection, and consternation. The Bees immediately forsake the hive without the hope of a return. They become a horde of vagabonds when they fall a prey to their enemies, or they die with the weight of their chagrin and sorrow. If the Queen forsakes her ordinary dwelling, whether it be that it is not commodious enough for her, or that the combs have been spoiled, or attacked by other insects, they still follow her with a constancy and fidelity beyond all conception, and they repair to the spot which they have chosen for their repose.

To this extremity extends the attachment of the Bees for their Queen; without her, their labour appears useless and unfruitful, because they are totally bereft of the hope of seeing their species perpetuated in their descendants.

Essentially necessary however as she is to the monarchy, she is not burthened with the government, nor with the police, nor the preservation of the laws. Each Bee performs that part which the good of the society demands, and it never neglects its duty. The intimation of any order is useless, or the proscription of any particular labour; it follows invariably that plan of conduct which has been laid down for it by the Creator from the commencement: hence that regular distribution of employment, that choice of talent, that vigilance and foresight, which have been attributed to the Queen Bee, are merely the fancies of the fabulists, and the vagaries of the poets. It is mere chance or the occasion which divides the species of labour to which every Bee is to dedicate itself: all are equally fitted to gather honey, to collect the

wax, or to build a cell. No variety of talent, no diversity of taste, nor inclination, have ever been observed amongst them. Each undertakes the first labour which presents itself. If a Bee abandons one occupation to perform another, it is for the purpose of refreshing itself, or because particular circumstances demanded it. The supernumerary Queens ought to be considered still less as ministers of the state. No hive requires, nor will suffer, more than one Queen. If there be more, they are all murdered *sans ceremonie*.

In regard to the young Queens, it is certain that they never lay any eggs in the hive in which they were born; they wait the departure of the swarms, to place themselves at the head, and to form an establishment independent of the Mother Queen. Those who have the misfortune not to be chosen to conduct the swarms, are massacred at the end of the summer, in the same manner, and at the same time as the drones, because the Bees will only suffer one Queen to govern them.*

The cell, in which the Queen Bee is born, is of a wholly different construction from that of either the drones or the common Bees. (See p. VI. fig. 1.) The cell of the latter is horizontal, whereas that of the Queen is perpendicular; the former is an exact hexagon, the latter is circular. Some apiarians dedicate a particular cell to which the Queen retires to repose

* Miles asserts that two Queens govern sometimes in the same hive, and that a large comb then forms a barrier of the two kingdoms. He would have been as near the truth, had he placed two kings at once on the throne of England.

from her labours, or to transact the affairs of the state, but this idea must have been begotten in the brain of the poet, or of the visionary enthusiast, the only purpose for which the Queen ever enters a cell being to lay her eggs, or to extract that nutriment which is necessary for her preservation.

On the side of the middle combs, the cell is constructed, which is to serve for the reception of the egg, from which the young Queen is to spring; and it is wonderful to conceive the certainty with which the Mother Queen knows the particular nature of the egg which she is about to lay. The cell, in which the egg of the drone is deposited, is differently constructed from that of the common Bee, the former being of an irregular shape, whereas the latter is a complete hexagon. It has been supposed by some naturalists, that there is no difference in the egg, but in the manner of its fructification; and that instead of all the eggs being fructified by the drones, that each is impregnated by its like; the drone by the drone, the common Bee by the common Bee, and the Queen by herself; and to substantiate this hypothesis, some have declared that they have discovered males amongst the common Bees. This is, however, one of the crotchets of the enthusiasts, who rather than not account for the secret operations of nature, which are concealed from the prying curiosity of man, will give water the property of flowing back to its source, and deny to light the inherent principle of vegetation.

When the Queen feels an inclination to lay an egg, she is by Nature endowed with the instinct of knowing the proper cell in which to deposit it. For

this purpose she enters the cell retrogradely; and having deposited the egg, she retires from it, and hastens to another. The drones enter the cell in the same manner, and emit the seminal fluid which fecundates the egg. The size of the drone prevents him however from introducing the whole of his body into the cell, but the organ of generation extends to the bottom, in order to touch the egg which has been just deposited by the Queen.*

The advocates of this system have had several difficulties proposed to them, and the unsatisfactory manner in which they have been solved, has been the cause of triumph to the adherents of the copulating system. Notwithstanding the assertions of many apiarians, and which are said to be founded upon actual and repeated observation, it is certain that not a single drone is permitted to remain in the hive during the winter. I have examined several hives, from the month of October to March, and I never yet could find a single drone. Here then the first difficulty presents itself:—In what manner are the eggs fructified in the spring, as there is not a single male to be found in the hive? The adherents of the system of coition assert, that previously to the destruction of the drones they fructified the Queen, and that she remains in that state until the spring. According to this hypothesis, it is not the egg which is fructified, but the body of the Queen; for in this case, how could the eggs

* Lüttichau, Jansen, Kratzer, Müller, and other German apiarians, have discovered seminal matter on the posterior of the Queen. They, however, evidently laboured under a most egregious error, for the matter which they observed, was only the fæces of her Majesty.

be fructified which were not in the ovarium of the Queen, at the time of the last coition with the drones? The analogy of the Bee with the Wasp, may be here fairly quoted. It is certain, from the simple circumstance of the Wasp hoarding no food, that the Queen or Mother Wasp is the only one which survives the season, unless it be supposed that the Wasp is an hibernating insect, for the belief of which we have not the slightest ground. It must then necessarily follow, that the Mother Wasp must have been fructified previously to the decease of the male Wasps at the end of the season, and that at the commencement of spring she sallies forth to build the nest in which to deposit her eggs. It cannot have escaped the observation of those, who are in the least acquainted with the natural history of the Wasp, that the Mother Wasp is the only one existing at the commencement of the season, and that she builds her habitation without any assistance from the common Wasp. It may however be possible, that the eggs in the ovarium of the Wasp, may have been all fructified, for there is no proportion between the number of eggs which the Queen Bee lays, and that which is laid by the Mother Wasp. My reasons, however, for not coinciding in the belief of the system of copulation have been already stated, and it now then only remains to solve the difficulty of the fructification of the egg in the cell, when there is no drone to be found in the hive. To ascertain the solution of this problem, I acknowledge that I have ruined several very fine hives, but the following is the result of my experiments. In the month of September, 1811, I observed one of my hives busily

employed in killing the drones, and I pitched upon this hive on which to commence my researches into this great arcanum of natural history. In a few days the work of slaughter had ceased, and I then drove the hive,* to satisfy myself that no drone remained; after an hour's arduous search I was convinced that not a single one was in the hive. Leaving the Bees then in the empty hive, I took the full one into the house, and began to examine the combs. My design in this instance was to discover some cells, in which the egg was in that state as if just laid by the Queen, and which might have been fructified by the drones previously to their expulsion. I was not long before I discovered the object of my search, and after cutting a small piece of the comb away which contained the cells in which the eggs had been deposited, I returned the hive to its place, and restored the Bees to it. I then proceeded to examine the eggs in the bit of comb, by the aid of a microscope, and I observed they were glossy and full, there was not, however, any mucous matter in the cell which could indicate the injection of the seminal matter by the drone. I conceived, however, that it might have been absorbed by the egg previously to my examination. These eggs were deposited in the regular hexagon cells, and consequently the common Bee was to be the produce. My next aim was to discover if there were any eggs

* As this expression may often occur in the course of this work, I beg that by, *driving a hive*, may be understood, the act of obliging the Bees to leave their own domicile, and take refuge in another. This is performed by placing the full hive under an empty one, and by gently tapping the lower hive, the Bees will all ascend into the upper, and the lower one then remains vacant, for experiments or the purpose of deprivation

in the drone cells, but the difficulty here was great, as the drones are always bred in the middle of the combs, and towards the upper end of the hive. To reach the drone cells, I was therefore obliged to cut away a considerable part of the brood combs, and which I knew was tantamount to the destruction of the hive. I arrived, however, at the drone cells with a comparatively small sacrifice of the brood combs, and having satisfied myself that there were eggs in the cells, I left the hive to repose for a month. In November, I again examined it, and found but a very trifling alteration in the eggs. They were rather larger, but I did not see a single cell closed, from which I could conclude that the process of generation was proceeding. During the whole winter I examined the hives at stated periods, and saw no visible alteration in the eggs. By the month of March, however, the whole of the eggs were hatched, and I found some drones in the hive.

From these experiments I draw the following conclusions:—That at the end of the season, the brood combs are filled with fructified eggs, which, as heat is necessary to their growth through the different stages, cannot be hatched in the coldness of winter,* that the warmth of the Bees at that time is not itself

* It was the opinion of M. Ducarne, a most able French naturalist, that the Queen even lays her eggs in winter. He says, "Quelquefois même il fait assez doux dans l'hiver pour engager la reine a pondre, et a deposer quelques œufs; mais ces œufs ne pourront guére eclore qu' apres l'hiver, quandles abeilles iront aux champs leur chercher de la nourriture." From this sentiment of M. Ducarne, we may draw the conclusion, that the Queen was impregnated by the drones previously to their expulsion. M. Ducarne should have mentioned what sort of nourishment the Bees collect in the fields, in order to effect the hatching of the eggs.

sufficient to bring the eggs to maturity, and that as the warm weather declines, the hatching of the eggs also gradually decreases, until it entirely ceases, awaiting the return of spring. Nor is there any thing in this hypothesis which is inconsistent with the usual operations of nature; on the contrary, it perfectly harmonizes with them. Moths, and other insects, deposit their eggs, covered with a silky film, and they remain in that state until the genial warmth of spring hatches them. The creature, which fructified them is no more, and the only thing which is then necessary for the production of life, is heat.

When a Queen Bee has not a sufficiency of labourers to construct the cells which are necessary for the laying of her eggs, she generally forsakes the hive, although it be full of provisions. To remedy this inconvenience, some empty combs should be placed in the hive. The ancients were acquainted with this method, and it is recommended by Varro. A more simple and efficacious method is, instead of putting into the hive detached pieces of combs, to place under it the hive of a colony which has died during the year. The brood of this hive will hatch with the warmth of the Bees, and thus the colony will be increased in numbers.

CHAP. III.

ON THE DRONES.

THE drone is easy to be distinguished from the other Bees of the hive: he is rather shorter than the Queen, but is much larger; and when he departs from, or enters the hive, he is always announced by his flight, which occasions that humming from which he derives his name. (See plate 1, fig. 2.)

The number of drones in a hive, varies according to its size; in some are 4 or 500, in others from 800 to 1200. Their number, however, is always in proportion to the number of working Bees.

The construction of the cells advances also in proportion to the number of working Bees, and the fecundity of the Queen in proportion to the number of cells; and when all the cells are constructed and filled with the eggs of the Queen, the drones immediately commence the office of fructification. If the laying of the eggs is more or less considerable, in proportion to the number of cells, the number of the drones ought to be also greater to effect the fecundation of the eggs of the Queen. She can lay about 4 or 500 eggs in the course of a day, and the work

of fecundation by the drone requires for its execution a much greater number of the species; thus Nature, with her usual foresight and wisdom, regulates the number of drones to that of the working Bees, by which all the operations of the hive proceed with the greatest harmony and exactness.

The drone has no offensive weapon like the working Bee: at the place where the sting of the latter is placed is situated the orifice of the case which encloses the organ of generation, destined to the fecundation of the eggs of the Queen.

Nature is too wise to have formed the drones, as some modern apiarians have represented it. The fate of the Queen Bee would be indeed unfortunate, if the work of generation were to be performed by these insects, as by the greater number of animals. A Queen Bee, the only one of her sex in the hive, with about 7 or 800, or even a thousand males, would be in the situation of the Queen of Acham, who kept a seraglio of men; I have, however, enlarged upon this subject in another place.

The antennæ of the drone have eleven articulations, those of the other Bees have fifteen. Their eyes, constructed with the *rete mirabile*, cover the whole of the upper part of the head, whilst the same eye of the common Bee forms a kind of oval on each side. Their teeth are smaller than those of the common Bee, nor are they required for the same purposes. Their proboscis is shorter, and more slender, for as they never gather any honey from the fields, but live entirely upon the stock of the hive, Nature has furnished them only with the means of imbibing the honey from the cells. Their proboscis

would not be sufficiently long to extract the honey from the flowers, where it is often hidden at a great depth in the glands. They have no triangular cavities on their legs; and Nature, in having refused to them the proper instruments for labour, appears to have exempted them from it. Their only occupation is in the fecundation of the eggs of the Queen,* although it is asserted by some naturalists, that a part of their office is the hatching and rearing of the young brood. It is certain, that they assist this operation by the increased heat which their presence occasions in the hive; but how then is it performed, when there is not a single drone in the hive, and this is at the commencement of the spring? It might also be supposed that this aid was more necessary at that period than at any other, when the exterior state of the atmosphere is not of that degree of heat, which is conducible to the hatching of the young brood. It is however agreeable to experience, that the drones always attach themselves to those combs which are filled with brood; but I believe their design, in this instance, has no relation whatever to a distinct occupation of hatching the brood, analogous to that of the male pigeon, in the office of incubation, but that they frequent those combs only, as it is there, and in no other part of the hive, that the Queen deposits her eggs, and consequently that their presence is not

* In a work entitled, *Praktische ockonomische Abhandlung von der Bienenzucht*, von Ladislaus Reichselen von Stoixner, printed at Nurnberg, in 1789, the drones are called *Rohrmeister*, or *Brunnenknechte*, which may be translated Water Carriers, and the occupation of these insects is supposed, by this visionary author, to be the conveying of water into the hive.

required in any other place. This opinion of the occupation of the drone is of a very remote date, as I find in an anonymous work, printed in 1572, that the drones are there called *Brooding Bees.*

The Abbé della Rocca, who, in all matters relative to the Bee, has an undoubted claim to our attention, is an adherent to the system of the drones being brooding Bees, but he qualifies this opinion by saying, that he does not consider this function so particularly attached to those insects, that in the absence of them, the common Bees cannot execute it. This I believe to be one of the most unanswerable arguments against the hypothesis; for the great Author of Nature is too systematic in his operations to endow an insect with a certain faculty, on which the continuation of its species depends, and yet that the increase of its species will proceed, whether that faculty be put in execution or not. No faculty is given to animals, nor insects, which has not some positive relation to their support or propagation, otherwise there would be that waste of power which is a complete denial of the wisdom and goodness of the Creator.

Reaumur and Debraw asserted, that they found in the same hive two species of drones, some large, and others smaller; the latter of which were, however, in the greatest number. The destination of the former was to become the father of the Queen, and the drones, of the first class; and the latter to be that of the common Bees, and the drones of their own species. I have attended to this particular in the examination of all my hives, but I never could discover more than one species of drones. The following may be perhaps the cause which led those naturalists into

this error:—The drones, arising from the brood of the preceding year, and which were hatched early in the spring, had attained their full growth, when those of the first brood of the spring being just born, had not yet attained their full size. I know that, in contradiction to this sentiment, it is held by some apiarians, that the Bee, in emerging from its cell, has attained its full growth; I would, however, recommend to those Gentlemen to try to thrust either a Bee, or a drone into one of the breeding cells, and he will find that the capacity of their bodies is too large for the dimension of the cell.

If by any accident, or untoward circumstance, a hive of Bees is deficient in drones, the fecundation of the eggs of the Queen does not take place, and consequently no swarms are produced.* Whenever this

* The Rev. Mr. Thorley is the only apiarian who asserts that a hive will swarm without drones. He says, in his Enquiry into the Nature, Order, and Government of Bees, p. 74, 2d edit. "that to his certain knowledge, the Bees sometimes breed all the summer season without drones. Several poor and weak stocks, which have but few Bees, and but little honey, have not any drones among them all the season, and yet these shall increase, prosper, and breed drones the following summer. I will give my readers," he says "only one instance instead of a multitude.

"Once I had a stock of Bees, which not only bred great numbers all the spring time, but also swarmed without any drones, as I was fully assured from the most strict and constant observation. Had there been one single drone in it, my eye or ear would certainly have discovered him.

"The old stock continued to prosper, and in about a month or six weeks, some drones, though few comparatively, appeared in it.

"The new swarm increased in numbers all that summer, but had no drones among them till the following spring. And I add further, that I have oftentimes known weak stocks, which have not bred drones for the space of about two years."

There is no wonder in Nature which an apiarian has not seen.

is observed, the adoption of the following method will be found to be of great service:—Watch at the entrance of one of your strongest hives, from the hours of eleven to two, the time at which the drones take their flight, and as they come out, or return, catch about thirty or forty of them, and as they have no sting, no danger awaits this operation; confine them in a bottle, or other close vessel until the evening, when you may introduce them to their new habitation. The hive will most readily receive them, the eggs will be fecundated, and in a short time a good swarm may be expected.

I had an excellent opportunity of verifying the truth of this experiment during the course of last October: I was walking in the fields contiguous to my house, when, to my great surprize, I observed a swarm of Bees passing at a short distance from me; I knew it could not be a natural, or regular swarm, as the drones in all my hives had been long since killed, and I had no doubt that the same circumstance had taken place in other apiaries. I was therefore convinced that it was a hive which, from some particular reason, had forsaken its dwelling. With great satisfaction I saw the strangers alight on a hedge, and hastening home for a hive, I soon took possession of my unexpected treasure. My difficulties, however, now were only at their commencement. In what manner were my new guests to be supported. Unfortunately I had not then in my possession any hive with combs, and the season was too far advanced to expect that any combs could then be constructed. By most indefatigable attention, I was enabled to preserve the Bees during the winter, and in the spring some combs

were constructed. On taking possession of the hive in October, not a single drone was to be found, and I was consequently in despair of obtaining any swarms from it. I therefore determined to adopt the experiment already stated, and the greatest success attended my labours. I introduced about fifty drones, the eggs of the Queen were fecundated, and I obtained two swarms from my hive in the course of the summer. I would however advise the person undertaking the above experiment, to move the hive into which he introduces the drones, to some little distance from his apiary, as the drones in their flight on the following day will be apt to return to their parent hive. This single experiment alone will refute the hypothesis of the fecundation of the Queen by the drone at the end of the season, and of her remaining in that state until the spring.

The drones are born at the commencement of the spring, they are called by nature to fecundate the eggs of the year, in which they themselves are born. Having fulfilled the object of their mission, they all perish, without exception; they are massacred, and dragged from the hive by the working Bees.

Considering the high and well deserved reputation which Mr. Reaumur enjoys as a naturalist, I am surprised that he should have advanced so singular a doctrine, as that the drone, like the moth of the silk worm, dies immediately after copulation.* Had he advanced this hypothesis upon his bare surmise,

* I find this opinion also advanced in Der Oesterreichsche Bienenmeister, oder vollständiger in Gestalt eines Katechismus abgefasster Unterricht in der Bienenzucht, von J. M C. Müller, printed at Vienna, in 1783.

I should have been induced to ascribe it to a redundancy of fancy; but that he should assert it upon ocular demonstration, authorizes me to call in question his skill and knowledge as an apiarian. The wonders which Bruce saw in Egypt, or which *he did not see*, but *related*, are trifling in comparison to the following wonder observed by M. Reaumur. I would travel from Dan to Beersheba to view such a sight.

"I enclosed," he says, "a young Queen with a drone in a glass vessel; I saw, with surprise, that for all the civility and kindness which the common Bees entertain for the Queen, she in return testifies the same for the drone; she caressed him first with her proboscis, then with her feet, as she walked around him, offering him at the same time some honey.* The drone bore all these incitements in the most stupid manner; in the space of a quarter of an hour, he appeared however to be a little more animated, and when the Queen, placed opposite to him, had with her feet pressed the head of this insensible drone, and had played gently with his antennæ, he at length determined to return her advances, by others of the same nature. By these passionate preludes, the

* M. Reaumur is not singular, in having viewed this phenomenon. Joseph Pössl, in his *Praktischer Bienenkatechismus für das Landvolk und Bienenfreunde*, printed at München, in 1787, also mentions, that the Queen mounts upon the back of the drone, and that she is often obliged to caress the sluggish drone before his passions can be excited, and sometimes even to feed him. This author asserts, that he has *often* viewed this process of coition; I consider it, however, as the mere repetition of the vagaries of former authors, and which are now repeated with all the confidence of demonstrative experience.

Queen at last excited the desire of her indolent spouse, who became more and more animate and active. I perceived distinctly, that a part of the interior organs, projected from the drone." (The Beef Steak of Bruce, from the rump of the live ox, is a mere *bagatelle* to this.) "This endearing behaviour lasted for two or three hours, during which time, they often rested, and then returned to their amours. At last the drone, took rather a longer sleep than was quite agreeable to the Queen, and she used her utmost exertions to awaken him from his lethargy; she teased him,—pawed him,—bit him,—all was in vain,—*the drone was dead.*

"This is not the only insect which perishes in this critical moment. I employed my best endeavours to console the widow (in what manner M. Reaumur does not inform us;) I gave her another husband, young and full of vigour, but to my great surprise, (in which M. Reaumur is by no means singular) she remained the whole of the day attached to, and weeping over, the corpse of her spouse. On the following day, the corpse was removed, and a new husband was presented to the Queen, to whom she behaved with greater civility than to the deceased. A single night was sufficient to make this Artemisa forget the mausoleum of her deceased monarch."

I must be excused, if, in the translation of the above passage, I have thrown over it an air of ridicule. Travellers are proverbially noted for telling wonders, and they do so often without fear of being detected, as centuries may elapse before another person travels over the same ground; but the natu-

ralist, who wishes to establish his reputation for the accuracy of his observation, the depth of his researches, or the profundity of his scientific knowledge, should be well aware how he advances facts founded on pretended actual observation, the verity or which can be proved perhaps on the following day by another.

I will venture to assert, in the most positive terms, and I am privileged to do it by nearly twenty years experience in Bees, that no person ever yet beheld the act of copulation performed by the Queen Bee and the drone. There appears to be almost an impenetrable veil spread over the operations of these insects, and it is that very mystery which makes their study so interesting. Keys says, "He never saw a drone with his *tail* in a cell," I believe him most firmly; but that is no reason why a drone never puts his tail in a cell. The following syllogism would, no doubt, please Mr. Keys:

> The egg of the Queen is fecundated by the drone in the cell,
> I never saw a drone with his tail in a cell,
> Therefore the egg is not fecundated in the cell.

I only regret that M. Reaumur did not astonish the world with his discovery after the time of the Abbé Della Rocca, as the knotty question could then be finally settled between those apiarians, whether the Queen mounts on the back of the drone, or the drone on the back of the Queen. It was most remiss in M. Reaumur not to have mentioned this important circumstance.

When a hive swarms, a number of drones always follow the emigrants, in the proportion of the working

Bees, for the purpose of the fecundation of the eggs of the young Queen, during the remainder of the season. They meet with the same tragical end as their fathers, as soon as they have fulfilled the duties of their vocation; and become, like the paupers of a parish, chargeable on the community. They have, however, previously fecundated the eggs, which are to hatch in the spring, and from which their successors are to originate. The drones consume much more than the common Bees, and the latter would not be able to amass a sufficiency for their support during the winter. How wonderful and regular are here the operations of Nature!

It now remains for me to describe their tragical end. When the Queen has exhausted her ovarium, and the laying of eggs has ceased for the season, the common Bees declare war against the males, and during three or four days the most cruel massacre continues. Although by their make the drones appear to possess a superiority over the Bees, yet they do not appear to offer any resistance to the attack. Three or four of them seize upon the drone, and leave him not until he is murdered. The whole sex must be annihilated and the Bees cease not until it is accomplished. During this period of carnage the front of the hives is a scene of murder, and horror. In some hives this tragedy takes place earlier than in others, but it is in general in the month of September, although in some climates, it takes place in August.

The state of agitation and inquietude in which the Bees are plunged, at the time of the massacre of the drones, obstructs them in their daily labour, and consequently a great quantity of honey is lost which

would have been amassed during that period. I am, therefore, of opinion that the Bees should be assisted in this undertaking, and the apiarian should watch at the entrance of the hive, and with a small piece of wood, kill every drone which appears. It is rather singular, that this plan is even recommended by some apiarians, who assert, that only a portion of the drones is murdered, and that the remainder are to be found in the hive during the winter. On this view it would be very imprudent in any apiarian to interfere with the murder of the drones, as he might kill too many: the case, however, being different, he may, with safety, undertake the office of an indiscriminate executioner.

It has been the opinion of some naturalists, that the Bee kills the drone by the means of his sting, and in order to account for the circumstance of the Bee not leaving his sting in the drone, and consequently proving his own murderer, as well as that of his victim, they pretend, that the cuticle of the drones is so very delicate that the Bees can extract their sting without danger. This is really begging the question, for certainly no one will dispute the proportion of delicacy, or fineness of texture between the cuticle of the drone, and the epidermis of the human frame; but in the many hundred, and I may add thousand times, in which I have witnessed the destruction of the drones, I never yet observed that the Bee made use of his sting. I have invariably observed that they attack the drone at the root of the wing, in the same manner as they do a wasp, or a marauding Bee. Whether they have the power of injecting a poisonous, or mortal matter into the body

of the drone, at a certain vulnerable part, I have never been yet able to ascertain, but I once took a drone which had been killed by the Bees, and examining him by the means of a powerful microscope, and I observed, that the roots of his wings had been, as it were nibbled away, and which accounts for the wings being always stiff and perpendicular in those drones, Bees, or wasps, which have been murdered in their sanguinary battles. The drone being a perfectly harmless insect, it is unable to make any resistance against the attack of three, four, or five Bees; but we will suppose that a wasp, in his predatory travels, scenting the sweet contents of the hive, dares to venture into the apiarian monarchy for the purpose of spoil, and is entrapped in his base designs by the wary centinels, would he suffer himself to be repeatedly stung by them, when he could return the compliment, and at all events, although he might be overpowered by numbers, yet he would sell his life dearly, as some of the warriors would fall by the venom of his sting; and in this instance, the wasp would have the superiority, for he does not leave his sting after employing it, and no person, who is acquainted with the make of the Bees' sting, but will allow that the cuticle of the wasp is of that hard nature, that the sting of the Bee would most certainly remain in it, and of course the Bee would die. The sting of the wasp would here have the superiority, for as it is not of that barbed nature as to prevent the insect from retracting it, the wounds which it would make would occasion the death of every Bee which came in contact with it. Now I would ask the apiarians, who assert that the drone dies by the sting of

the Bee, whether they ever examined one of the massacred drones, and if they did, whether they ever found even a scar or wound indicative of the sting of the Bee? Besides, a very important question here arises, and which is particularly interesting to naturalists. The drone is evidently a species of the Bee, though differing in its make and form from the common working Bee: the question which arises then, is, would the venom of one Bee, which, in its nature and constituent parts, is perfectly the same as in another, have the effect of causing instant death to any Bee in which it might be injected by the means of a sting? I can conceive that the venom of the wasp might have the effect of causing death to a Bee, as being different in its constituent parts to the venom of the Bee, which is itself a constituent part of its body; but that the venom of one Bee should cause death to another of its own species, is to me one of those paradoxes which time and experience alone can solve.

It is curious to observe the contradictions and inconsistencies which often attend the observations of some noted apiarians, and on whose judgment many persons are disposed to rely with implicit faith, carried away with the sound of a noted name. I shall have frequent occasion, in the course of this work, to notice the experiments and discoveries of L'Abbé Della Rocca; and although I acknowledge that the natural history of the Bee is much indebted to him for some very important discoveries; yet, his relation is often tainted with those contradictions, which sully the integrity of his remarks. In the case now under consideration, he says, "In the destruction of these

unfortunate insects (the drones) the Bees not only make use of starvation, but they also employ their teeth and their stings. Whichever method they adopt, no injury whatever accrues to themselves; for if in stinging their victims, they left the sting in the wound, it would be found in the corpse of the drone; a part also of their entrails would be seen; and the number of those which would die, would cover the base of the hive, and prevent the ingress and egress of the surviving Bees. The stings of the Bees do not remain in the wounds which they inflict on the drones."

I think it will be allowed that the argumentative part of this passage goes to prove, that the Bee, in piercing the drone with its sting, does not leave it in the wound, owing to the thinness of the cuticle of the drone. This is very plausible, and to the inexperienced apiarian it might appear as decidedly convincing; but suppose we penetrate a little deeper into the opinion and observations of the Abbé, and we shall find that he says, "I have often seen the Bees at war with the drones; and the former, on being anxious to disengage themselves, *found themselves attached to the latter by their sting*, but they succeeded in extricating their sting, without dragging away their entrails, *which is a convincing proof* that the Bees "wound each other with the sting, without any mortal consequences."

I must acknowledge that it is not to me a convincing proof, for I confess myself an infidel in the principle, that the Bees make use of their sting at all in their wars with each other, or in the expulsion of the drones. Any person may convince himself of the

truth of my opinion, by taking a Bee from a hive, and attempt to introduce it into another, and he will immediately perceive that the Bees attack the intruder, by seizing him at the root of the wings; and it would be a natural conclusion to draw, that the intruding Bee would attempt his freedom, by wounding his antagonists with his sting; but the case is otherwise, for he never makes the slightest indication of using his sting; and as if he should not be so fortunate as to effect his escape, he will be killed in less than a minute; the person can soon convince himself of the manner of his death, by a little examination. He will not be able to find a single scar nor puncture effected by the stings of the Bees, but he will find the roots of the wings gnawed, and in almost a perpendicular position. Amongst the numerous authors, foreign and domestic, which I have perused, on the Natural History of the Bee, I do not recollect to have met with any mention of this manner of effecting the death of the drones, but in one anonymous French author. He says, "The Bees either strangle the drones, or starve, or stab them with their stings; *sometimes they content themselves with simply breaking their wings at the roots,* and then leave them to become vagabonds and vagrants on the ground, where they soon become victims to hunger, cold, birds, and other insects."

In regard to the starvation of the drones by the Bees, for which purpose they expel them from the combs, I do not consider that it has any foundation in truth. It is certain that as the time of their massacre approaches, they are gradually driven from the upper combs, and during the time of their murder,

not a single drone is to be found in the upper part of the hive. The Bees then become most avaricious of their store, and they grudge every drop which goes to the nourishment of a drone, and it is possible that their murder is rendered more easy to the Bee, by the weakness of the drone, which is produced by the scanty supply of food which the Bees allow him to take; but I have no reason to believe that the death of a drone is ever occasioned by complete starvation.

CHAP. IV.

ON THE COMMON BEES.

THEY are called common, because they in fact compose the community of the hive; of which the drones only form a part, during a short period of time. They are also called working Bees, because they alone bring provisions into the hive, construct the combs, nourish the brood, defend the monarchy, in one word, because they perform all the labour useful to the community. In some parts of England they are called *mules*, because they are not considered to possess any distinct sex. Experience has fully proved them to be neuter.*

* Few nations have studied the economy and management of the Bee more than the Germans, and the books which have appeared on that subject in Germany may really be said to be innumerable. It is, however, singular, that the apiarians of that country still maintain the greatest errors in regard to the natural history of the Bee. They call the common Bees *unvollkommene weibchen* (imperfect females), and assert that they lay the eggs from which the drones originate, and that this office is performed solely by the young Bees. The fallacy of this opinion is too apparent to require any formal refutation; but it is surprising that that opinion should be still maintained by the majority of the German apiarians. Hampel, a noted German apiarian, considers the hive to consist of two sort of Bees, the common Bee, and the working Bee, and they distinguish themselves by the former breeding only common Bees, whereas the latter breed drones. This appears to be a favourite doctrine of the German apiarians.

Some authors maintain, that in the monarchy of the Bees, a regularity and an admirable subordination are to be observed; that a well regulated distribution of employment is remarked, as well as perfect order and concert, which must result from minds, conspiring to the execution of the same plan; but that, which, in men, would be the effect of reason, correspondence, or co-operation, is in the Bees but the effect of that instinct which is implanted in them by the great Creator. In regard to the diversity of the employment and occupations, which some have pretended to have observed amongst them, such as, that there are particular Bees destined to the collecting of honey, others of wax, some to construct the cells, and others to nourish the brood, by which those who are adapted to one employment would not succeed in the performance of the others, is in fact all ideal, as will be proved in the sequel of this Treatise.

Pliny says, in his eleventh Book, "that the Bee is the only insect created for the utility of man," but it has been observed, by a late author, that Pliny was mistaken, for he ought to have added the silk-worm. But a question arises, if Pliny was acquainted with silk, or if he knew that it was the production of an insect. The ancients extracted less utility from the silk-worms than from the Bees; the culture of which was infinitely more extended. It may be also said, that Pliny speaks but figuratively; the utility of the Bee being better known, and rendered more public and profitable. Besides the Bees, and the silk-worms, there are other insects which could be useful to the human species in one way or another.

We are acquainted in England but with one sort of

Bees, although the foreign naturalists mention three, and some even four, but this latter kind is very rare, and has not yet been naturalised. In the islands of the Archipelago, it is said to be rather numerous, and that it maintains a continual war against the domesticated Bee, for the purpose of stealing its honey. The generality of apiarians mention two sorts of the common Bee, a larger, and a less, but I conceive them in this instance to labour under the following error. The Bees which are bred the first in the combs of a hive, will always be larger than those which are bred in an old stock hive, and for this reason the cells of the old stock, having had repeatedly young ones in them, are each time diminished in their capacity by a small film, which the Bee on quitting the cell leaves behind it, and consequently the Bee, which is subsequently bred in that cell, will be small in proportion to the thickness of that film. On the other hand, the Bee bred in the cell of a new hive will be larger, on account of the cell being of its full and natural size, and no film remaining in it from any former brood. The larger the Bee the greater is its indolence, and in other respects the small Bee has always the advantage over the larger.

It is to this small, but wonderful insect that we are indebted for all the honey and wax, which forms a part of our domestic, and commercial relations. When we consider that the former is amassed from those small, and to us almost imperceptible globules, which are found either in the chalice of the flowers, or exude from the trees, we cannot be sufficiently impressed with admiration at the indefatigability, and

labour of the Bee. It appears to labour less for the preservation of its own existence, than for that of its species, and the prosperity of its populous state. The days on which the honey abounds in the flowers, and on the leaves of certain trees, the Bee is observed to be uncommonly industrious, entering, and leaving the hive with wonderful rapidity; the office of collecting the farina from the plants, is not, however, neglected, and it is very easy to discriminate between the Bee which has been collecting honey, and that which has been only collecting farina. The shape of the former is always cylindrical, whereas that of the latter is oval.*

In regard to the physical description of the Bee, the most remarkable parts of it are the head,† the breast, and the belly. On the former are observed two rete mirabile eyes placed in the side, two antennæ, two hard teeth or jaws, and which play on opening, and shutting, from the left to the right. These teeth enable it to collect the wax, to knead it, to construct their cells, and to remove from the hive every obnoxious thing.

Below these two teeth, we observe a proboscis, which has the appearance of a thick fleshy substance very shining and of a chesnut colour. This substance

* Some apiarians assert that a Bee collects both honey and farina at the same time. To refute this opinion, it would be only requisite to watch at the entrance of the hive during the hours of labour, and the fact will disclose itself, that many Bees enter with the farina on their legs, whose body has not a cylindrical and highly glossy appearance, whilst others which have that appearance have no farina.

† Herr von Stoixner, a German naturalist, undertook to anatomize the body of the Bee, and found brains in the head, a heart, and all other animal viscera. This opens a new field for the Craniology of Dr. Gall.

is divided in two parts, very supple at the end, and it is only seen at its full length, when the Bee is employed in collecting honey or sipping water. This proboscis is a most wonderful machine, the use, and construction of which, have been developed by M. Reaumur with wonderful sagacity. To the simple view, it appears enveloped with four kinds of scales, which form together a channel by which the honey is conveyed. The proboscis, which is in this channel, is a muscular body, which by the means of its muscular motions, makes the honey ascend into the gullet. If the teeth be separated, we observe at the orifice of the proboscis an opening, which is the mouth, and above it a fleshy substance which is the tongue. The uses of these parts will be explained in the sequel. The breast is attached to the head by a very short neck; it carries four wings on it; the two last of which are longer than the other. It has six feet, on the two hinder of which are two triangular cavities, in which the Bee by degrees collects the particles of the farina from the plants. At the extremity of the six feet are two sorts of fangs with which the Bees attach themselves to the sides of the hive, and to each other. From the middle of these fangs, on the four hinder legs, project four brushy substances, the use of which is to collect the dust of the flowers, attached to the hair of their body. These brushes have the same use as hands.

The body, properly called, or the belly, is united to the breast by a species of thread and is composed of six scaly rings. The whole body of the Bee appears even to the naked eye to be well clothed. Age makes a little difference in them in point of

colour, those of the present year are brown, and have greyish hair; those of the preceding year have reddish hair, and the scales less brown, rather inclining to black; their wings are also often torn, and fringed at the ends by their former flights. On the breast, and on the wings of the body are observed small orifices, or pores in the shape of a mouth, by which the Bee respires, these are the lungs, and they are technically called *Stygmates*, this part, which is of a wonderful construction, is common to them, as to all other insects.

The interior of the belly consists of four parts; the intestines, the honey bag, the venom vessel, and the sting. The intestines, as in the animals, serve for the digestion of their food. The honey bag, when it is filled, is as large as a small pea, transparent as crystal, and contains the honey which the Bees have collected from the flowers, and which is disgorged into the cells to nourish the hive during the winter.

I have great reason to believe, and I am justified in the opinion from repeated experiments, the results of which have been always similar, that the honey which the Bees secrete in this vessel is only appropriated to the provision of the hive; that which is destined for their own nourishment never enters into it, it passes through the viscera destined to the purpose of digestion. I was first led to this opinion by never having observed any communication between the vessel, and the entrails, and until some decisive discovery be made on this head, I may be permitted to retain this opinion.

In order to convince myself of the above cir-

cumstance, I have repeatedly committed murder, though with reluctance, on some of my Bees, during the middle of the last very severe winter, when I was certain that no honey was to be obtained exterior to the hive. In not one single instance did I find any honey in the bag of the Bee, it appeared to be shrivelled up, and was scarcely perceptible; I, however, extracted the bag, and examined its interior most minutely, and I was persuaded that no honey had been in it for some time.

The vessel which contains the venom is at the root of the sting, along which the Bee ejects some globules, as along a tube, in order to spread into the wound. The sting is situate at the extremity of the belly of the Bee. It is about two lines* in length, and enters with great rapidity, by means of certain muscles, which are placed very near the sting, and which are very perceptible on squeezing the hinder part of the Bee. Its extremity is barbed, the teeth of which are turned in the direction of an arrow, which enter with facility, and cannot be extracted without causing a laceration. The wound which the Bee makes is almost always fatal to it; when it wishes to withdraw its sting, it remains in the wound, and with it the Bee loses the vessel of venom, which is at the root of the sting, and the ligaments to which it is attached. The Bee thus wounded cannot live a long time, it perishes after having made war in the manner of the savages, with poisoned arrows.

The poison is the most virulent in the summer, but the swelling which it occasions is more or less considerable according to the constitution of the person.

* A line is the twelfth part of an inch.

To some persons the sting of a Bee is of little importance, occasioning only a slight inflammation. I have seen the head of Bonner, who was very bald, literally studded with stings, and yet no swelling whatever took place, nor were they attended with any pain; but had any other person experienced a twentieth part of these stings, the consequences might have been very serious.

Many remedies have been suggested for the sting of the Bee. Vinegar, urine, the juice of certain plants, as the dandelion, dock and others, and olive oil, which is said to be a remedy even for the bite of the viper. All these applications, and even water itself, assuage the pain for the moment; but the pain and the inflammation gradually return, as the virtues of the application decrease. The surest method to diminish the effect of the sting, is to extract it immediately, and strike the wound with some goulard or laudanum. I have universally found this application to be the most efficacious. It must however be considered, that the remedy must be suited to the constitution; for that which will succeed with one person, will fail with another. There are some persons who assert that, after a certain number of stings received in any period of time whatever, the inflammation does not take place. I totally dissent from this opinion; for after an experience of twenty years amongst Bees, in which time the number of stings which I have received is innumerable, I am as much affected by one, as at the commencement of my career. M. Lombard is however of the former opinion, for he says, that the stings which he now receives are not attended with such painful consequences as when he

was first stung; and he wishes to know, if in length of time a species of inoculation of the venom of the Bee does not take place which neutralizes its effects. If this visionary apiarian could verify this fact, I would place his statue in the next niche to Dr. Jenner. The nineteenth century could then boast of one important discovery, and which would excite the gratitude of all future apiarians. The sting of the Bee so formidable and appalling to the young apiarian would then be a mere nullity, as he would only have to be inoculated with the venom, to be in future, and for ever more, rendered venom-proof.

Swammerdam speaks of the possibility of avoiding the sting of the Bee, on which an experiment is to be made. He advises to present a piece of old hat to the Bee, and to cut away the point of the sting. He adds that the Bee does not die, but that it is rendered incapable for ever after of stinging.

About thirty years ago a fly, the sting of which was venomous, was very troublesome in many parts of Prussia, and a specific was published, which was not only a cure for the sting of that fly, but also for that of the bees, wasps, &c. It is as follows:—Beat an onion on a hard body to extract the juice, to which add a pinch of common salt, apply the juice to the sting, and the pain and inflammation will instantly cease.

All these details can only produce in every rational man a more distinct and extensive knowledge of that infinite intelligence, which has arranged the creatures of this earth, presided at their organization, and regulated their existence and configuration. There is nothing in nature which can so forcibly demonstrate

to us an equally wise and powerful author. The insects the most vile are, perhaps, more admirable in their construction than the sun, and the most brilliant stars. What proportion! what harmony! what correspondence in every part of the Bee! How many combinations, arrangements, causes, effects, and principles, which tend to the same end, and concur in the same design! What exactness, what symmetry, in its little body, apparently contemptible, and in little admired by ignorant and inattentive persons! As in the greatest of animals, so we observe in the Bee vessels without number, liquids, motions often united in an imperceptible point—all the organs of life, the instruments of labour, the means of escaping from their enemies, weapons to command victory, and a thousand beauties which adorn its exterior form!

Every thing in these insects announces that supreme wisdom which presided at the formation of a work, so perfect, so industrious, so superior to every thing which art could ever invent. Every thing here is for our use and benefit. The Bees, in fact, make use of their wonderous qualities only for our good. It is for us that they work; and it is towards Him therefore who has given to them these inclinations, that we ought to express our love and gratitude.

CHAP. V.

ON HIVES IN GENERAL.

AMONGST those animals, or insects, who live in societies, there are some who are obliged to select for themselves a dwelling, to co-operate in the procuring of the necessary provisions, and to amass a certain quantity, a part of which is to be allotted for the winter food. In this class must be reckoned the domestic Bees, who, either in their natural or artificial dwelling, collect a quantity of honey, not only for the support of their young and their larvæ, but also for the Queen and themselves, during the time in which the weather will not permit them to collect it n the fields.

The forests were certainly the first domicile of the Bees, and it is only the moderns who conceived the idea of transporting them to their farms, or cottages, in order to make their honey an object of economy: it might also have happened, that this transportation of the Bee owes its origin to some philosopher, for the purpose of satisfying his curiosity. Pliny informs us, that the philosopher Aristomachus was so preju-

diced in favour of these insects, that he studied them for fifty-eight years.

There are some countries in Europe, however, in which the Bee may be said still to exist in its savage state. In Poland, for instance, the inhabitants have no regular Bee-hives: every peasant who is desirous of rearing Bees goes into the forest and district belonging to his master, without even his leave, makes a longitudinal hollow aperture, or apertures, in the trunk of a tree, or in the collateral branches, about three feet in length, one foot broad, and about a foot deep, where he deposits his Bees, leaves them some food, but pays very little farther attention to them, until late in the autumn, when, after cutting out some of their honey, and leaving the remainder for their maintenance, he secures the aperture properly with clay and straw against the frost and inclemency of the approaching season: these tenements (if they may be so called), with their inhabitants and the produce of their labour, then become his indisputable property: he may sell them, transfer them, in short, he may do whatever he pleases with them; and never is it heard that any depredation is committed on them, except by the bear. In Poland the laws are particularly severe against robbers, or destroyers of this property, punishing the offender, when detected, by cutting out the navel, and drawing out his intestines round and round the very tree which he has robbed.

Varro is the first who mentions the use of hives as a receptacle for the Bee; since his time the form, as well as the materials of them, have been much varied, and they are to be found of all sizes and forms in different parts of the world.

When Bees were first cultivated in Germany, the hives consisted of excavated trunks of trees, which were placed perpendicular in a row. In Spain they form them to this day of an excavated trunk of box. It is asserted that this species of wood possesses the advantage of attracting the swarms, and contributing to their health and fecundity, which is an advantage perhaps peculiar to the climate.

In Russia the swarms are placed in earthen vessels; and in Provence and different parts of Italy they are made of four planks well fastened together. In the latter country they are also made of the trunks of trees.

It is universally known that the hives in this country are generally made of straw, in the form of a bell (see Pl. III, fig. 6.); and I am convinced, that it is the most incommodious shape, not only for the apiarian, but for the Bees. It is a most difficult operation to extract from these hives any part of the honey, especially as the operation is impeded by the sticks which are placed horizontally in the hive, and even by some persons perpendicularly. I am, therefore, not in the least surprised at the ill success which attended the exertions of Bonner, in Scotland, to induce his countrymen to refrain from suffocating their Bees, and instead of which, to take from them all their superfluous store. It is however to the form that I object, and not to the materials of which they are made; for of all the materials which have been selected for the formation of a hive, I conceive no one to be more eligible than straw. The Abbé della Rocca says, that it is injurious to the health of the Bees. This opinion I can positively contradict; but

I am convinced that it is from the shape of the common hive, and the attendant difficulty of extracting any part of the honey, that the system of suffocating the Bees originated. I never yet performed the operation of depriving one of these hives of some honey without murdering a number of Bees, and running a very great risk of massacring the Queen. It is high time that the bell shaped hive should be exploded; but it is for the reasons above quoted, and not that I conceive a greater pleasure, or advantage, is derived from the use of the glass or wooden hive. By means of the former, some apiarians have pretended that they have witnessed the most secret operations of the Bees, from the formation of a cell, to the copulation of the Queen with a drone. I am certain that every information which is gained of the interior economy of these insects, is extracted from them unwillingly, and by the mere dint of incessant curiosity and force. I have kept glass hives of every sort, in hopes of succeeding in obtaining some clue to the development of their secrets; but I candidly confess that light was no sooner admitted to the hive than the utmost confusion prevailed in that part, and the Bees were seen running about in the greatest consternation: consequently I never attained to the knowledge of a single operation of the Bees by means of a glass-hive. A Bee will only work in complete darkness; and I always call the truth of those experiments into question, which are said to result from an examination, or a view of the hive, which could not have been effected without the admission of light.

Other disadvantages which attend the common hive are, that as the interior cannot be inspected, nor

cleaned, it is almost impossible for the common apiarian to protect his Bees from the ravages of the moths, which generally commence their depredations in that part of the hive to which the particular form denies all access to the attentions of the proprietor.

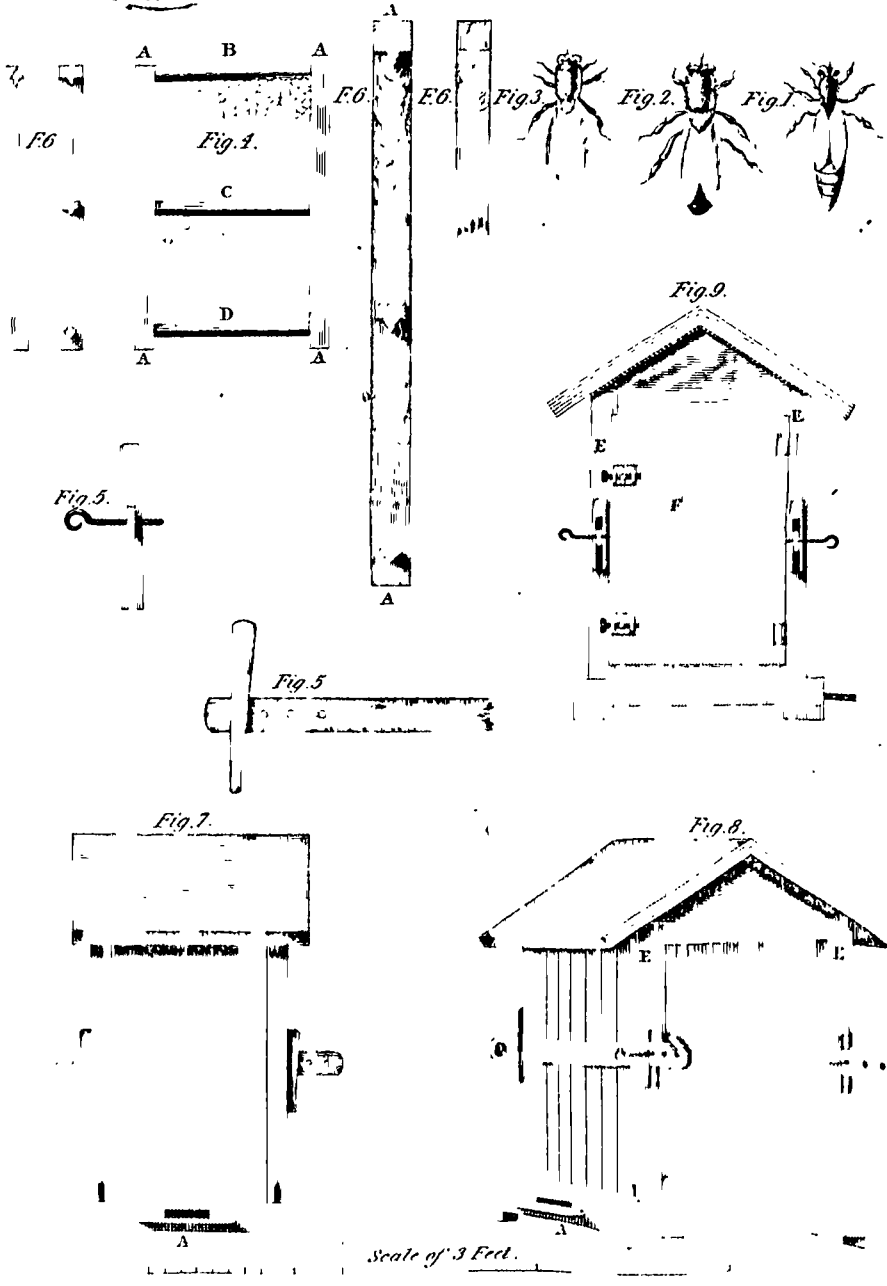
Although the Bee will work in a vessel of almost any shape, yet the choice of that shape is by no means of that ulterior importance which is attached to it by certain persons. The country people, in general, make use of no other hive than the common straw one, they are sensible of its inconveniences and defects, but their prejudice in this instance gets the better of their interest. They will not be advised to try another shape, because their forefathers did not use it: custom has also reconciled them to it, and so long as they can obtain the honey, the lives of the Bees are of little consequence.

The amateurs have departed from the common track in the invention of hives of different forms, and it cannot be questioned that each person thinks his own invention the best. One improvement naturally gave rise to another, and with wealthy apiarians we now see hives of different constructions, whilst the simple villager remains immovably attached to the common one.

As the defects in the construction of the edifices of the Bees gradually manifested themselves, some skilful and well designing persons undertook the reformation of them, and endeavoured to bring the form of them to perfection. Among many others I must quote Huber and Gelieu, in Switzerland; Falchini, in Italy; Della Rocca, in the Archipelago; Wildman, Keys, White, Bonner, and Thorley, in England;

THE BOMBAY BRANCH

Plate I.



THE HIVE OF HUBER.

Published by Baldwin Cradock & Joy Paternoster Row July 1

in France—Palteau, Duchet, De Bois-Jougan, De Mossac, Beville, Caignard, Ducouedic, Lombard, &c.; and in Germany—Engel, Cuinghein, Rompel, Wintzel, Riems, Kâstner, Schirach, Herold, Steinmetz, Neidhardt, and others. I will investigate the merits of the several inventions separately, and the apiarian will then be guided in his adoption by the superiority of advantages which each presents. The hive of M. Huber is composed of eight frames instead of twelve. The frames are eighteen inches in height instead of twelve, without the clear; within, the height is seventeen inches, and in breadth ten inches. The figure 4, Pl. 1, represents one of these frames. The uprights A, have an elevation of eighteen inches and one of thickness, and fifteen lines in breadth. The upper cross bar B, is of the same thickness and breadth. The cross bar C, is ten lines broad, and four lines thick; it is placed at the height of six inches and a half. The lower one D, is square, six lines in thickness; it is placed at an inch from the bottom. At the two extremities of the eight leaves, there is at each side, a frame E E, each of which is destined to receive a glass partition at the side of their interior, and at their exterior a shutter. This frame is eighteen inches in height to thirteen and a half inches in breadth; the opening of the frame to receive the glass partition and the shutter, is ten inches in breadth, and fifteen in height, the whole within the work. The shutters ought to be hinged, that they may be opened and shut at pleasure. The eight leaves are made of deal, the two outer ones are of walnut-wood, of one inch in thickness, and the shutters must be ten lines in thickness. The frames and the shutters may be

made of oak. The leaves are only united on one side with the hinges, as it would otherwise possess the disadvantage of exposing the Bees to be crushed in shutting the frames. Instead of the hinges two cross bars, nineteen inches long, fifteen lines broad, and four thick, enter at the middle of the height; and from the two sides of the two glazed frames, into the part which projects along the side of the eight leaves, and receive in the holes regularly boréd, a small iron pin; and, in order to fix the whole firmly, there are four wooden pins, or wedges, sloping gradually to the end (see fig. 5.). They are driven under the iron pin, which they close upon until the whole is solidly united. The entrances of the Bees, which were at the bottom of the leaves in the great front, are reduced to a single one, at the bottom of one of the little sides, bored in the thickness of the foundation board, with a small projecting plank for the walk of the Bees (fig. 7 and 8, A). This disposition renders the deprivation of the honey more easy, because the honey-combs are found in the frames of the two extremities, where the Bees deposit it, in order to obey the law of their instinct, which obliges them to place their treasure in that part most distant from their entrance. To determine the Bees to work on the plane of each leaf, M. Huber places at the top of each a small piece of honey-comb, and this is the most advisable method. But Mr. J. Hunter, in a letter inserted in the Memoirs of the Royal Society of London (Philosophical Transactions), having proved that a ridge, forming a salient angle, or even a returning angle, determined the foundations of the combs of the Bees; and M. Huber having acknow-

Fig. 1

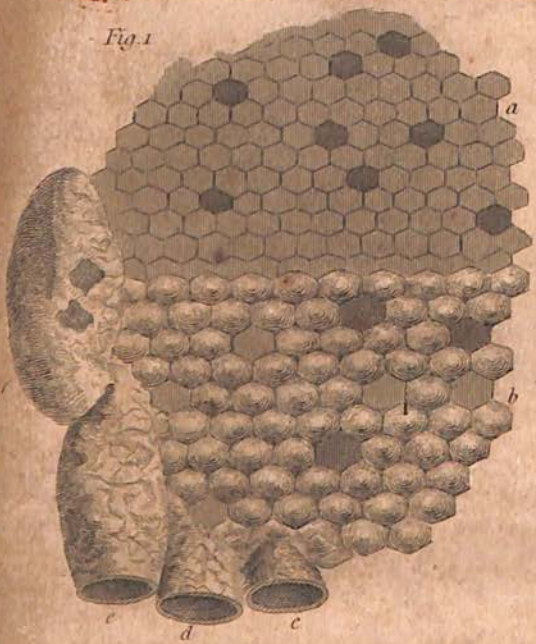


Fig. 4

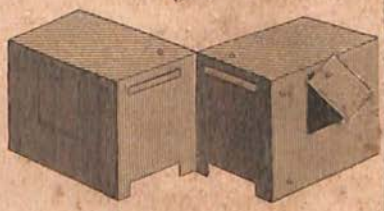


Fig. 5

Fig. 2

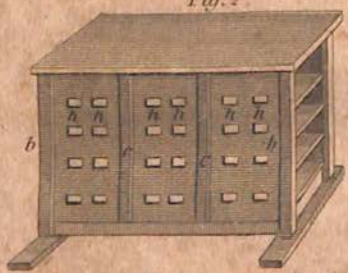
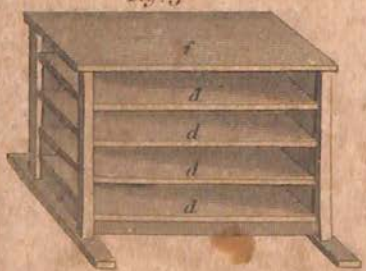


Fig. 3



E. Rudd del.

T. Woodthorpe Sc. 29 Fetter Lane.

HIVES OF WHITE & THORLEY.

Published by Baldwin, Cradock & Joy, Paternoster Row, July 1815.

ledged the general truth of it, he formed a salient angle under the cross bar B and C of each leaf (see fig. 6.).

Finally, Mr. Huber, adds to his Hive a covering composed of three pieces, two of which are placed on the side of the cross bars, and the third in the manner of a roof, rests on these two pieces, and this is intended for those Hives that remain in the open air. (See fig. 7.)

Mr. Thorley has added to the edition which he has given of his father's book, a postscript purporting that persons who chuse to keep bees in glass hives may, after uncovering the hole at the top of a flat-topped straw hive, or box, place the glass over it, so close that no Bees can go in or out but at the bottom of the Hive or Box; the glass Hive must be covered with an empty Hive or with a Cloth that too much light may not prevent the Bees from working. As soon as they have filled the straw Hive or Box, they will begin to work up into the glass Hive: he tells us, that he himself has had one of those glass Hives filled by the Bees in thirty days in a fine season, and that it contained thirty-eight pounds of fine Honey. When the glass is completely filled, slide a tin plate between it and the Hive or Box so as to cover the passage, and in half an hour the glass may be taken off with safety. What few Bees remain in it, will readily go to their companions. He has added a glass window to his straw Hives, in order to see what progress the Bees make, which is of some importance, especially if one Hive is to be taken away whilst the season still continues favourable for the collecting of honey; for when the Combs are filled with Honey, the cells are sealed

up, and the Bees forsake them and reside mostly in that part of the hive in which their works are chiefly carried on; observing, also, that the Bees were apt to extend their combs through the passage of communication into the upper hive, whether glass or other material, which rendered it necessary to divide the comb when the upper hive was taken away; he now puts in that passage a wire screen or netting, the meshes of which are large enough for a loaded Bee to go easily through them: this prevents the joining of the combs from one box to the other, and consequently obviates the necessity of cutting them and of spilling some of the honey, which running down amongst a crowd of Bees used before to incommode them much; it being difficult for them to clear their wings of it. Fig. 5, plate 6, is a drawing of one of his colonies.

The Reverend Mr. White of Holton, in Suffolk, has contributed very much to improve the colonizing system. In his directions to make the bee boxes of his own invention, and of the manner of constructing a single one, he says, that it may be made of deal or any other well-seasoned boards, which are not apt to warp or split. The boards should be near an inch thick, the figure of the Box square, and its height and breadth nine inches and five-eighths every way, measuring within; with these dimensions it will contain near a peck and a half of Bees. The front part must have a door cut in the middle of the bottom edge, three inches wide, and near half an inch in depth, which will give free liberty to the Bees to pass through, and yet not be large enough for their enemy the mouse to enter. In the back part, a hole must be cut, with a rabbit in it, in which a pane of the best and clearest crown glass

must be fixed about five inches in height, and three in breadth, and fastened with putty; the top of the glass must be placed as high as the roof within side, that the upper part of the combs may be seen, where the Bees with their riches are mostly placed. By these means, a better judgment will be formed of their state and strength, than if the glass were fixed in the middle; the glass must be covered with another piece of board by way of shutter, which may be made to hang by a string, or turn upon a nail, or slide sideways between two mouldings.

The side of the Box which is to be joined to another Box of the same form and dimensions, as it will not be exposed to the external air, may be made of a piece of split deal not half an inch thick, this is called the side of communication, because it is not to be wholly enclosed: a space is to be left at the bottom the whole breadth of the Box and a little more than an inch in height, and a hole or passage is to be made at the top three inches long, and more than half an inch wide; through these, the Bees are to have a communication from one box to the other: the lower communication being on the floor, the Bees with their burthens may readily and easily ascend into either of the Boxes; the upper communication is only intended as a passage between the Boxes, resembling the little holes or narrow passes, which may be observed in the combs formed by the Bees, to save time and shorten the way when they have occasion to pass from one comb to another, just as in populous cities there are narrow lanes and alleys passing transversly from one large street to another.

In the next place a loose board must be provided

half an inch thick, and large enough to cover the side where the communications have been made, several little iron staples must be kept in readiness an inch and a half long, with two points or ends bended down more than half an inch.

No directions are necessary for making the other Box, which must be of the same form and dimensions. The two Boxes differ from each other only in this, that the side of communication of the one, must be on your right hand, of the other, on your left. Fig. 4, plate VI, represents two of these Boxes with their openings of communication ready to join to each other.

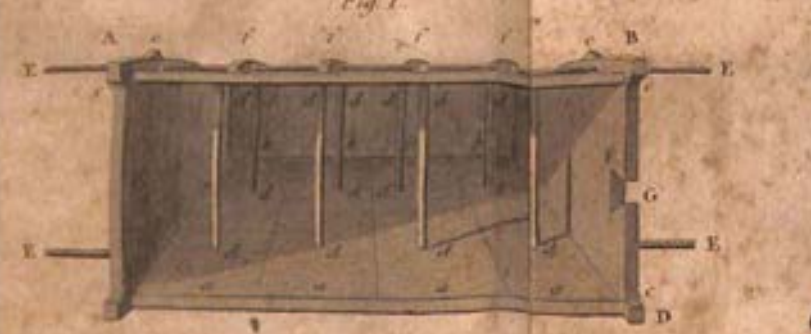
Fig. 2. plate VI, represents the front of a frame for twelve Colonies, a a are two sills of Oak lying flat on the ground, more than four feet long. In these sills four oaken posts are to be fixed.

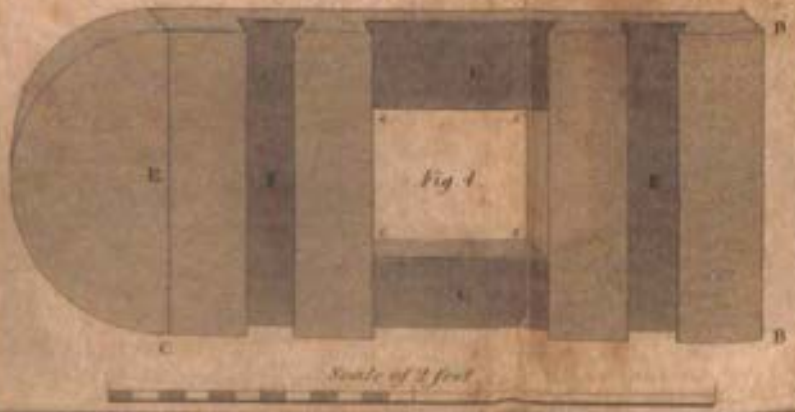
The two posts b b, in the front, are about six feet two inches above the sills, the other two standing backwards, five feet eight inches.

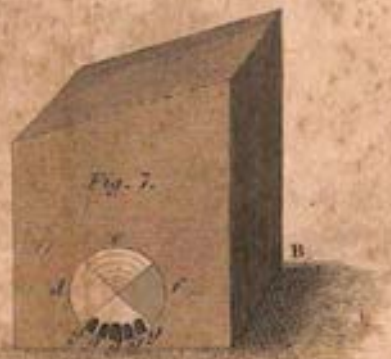
Some boards of split deal must be next nailed horizontally from one of the fore-posts to the other, to screen the Bees from the sun, these boards must be seven feet seven inches in length, and nailed to the inside of the posts, and be well seasoned that they may not shrink or gape in the joints.

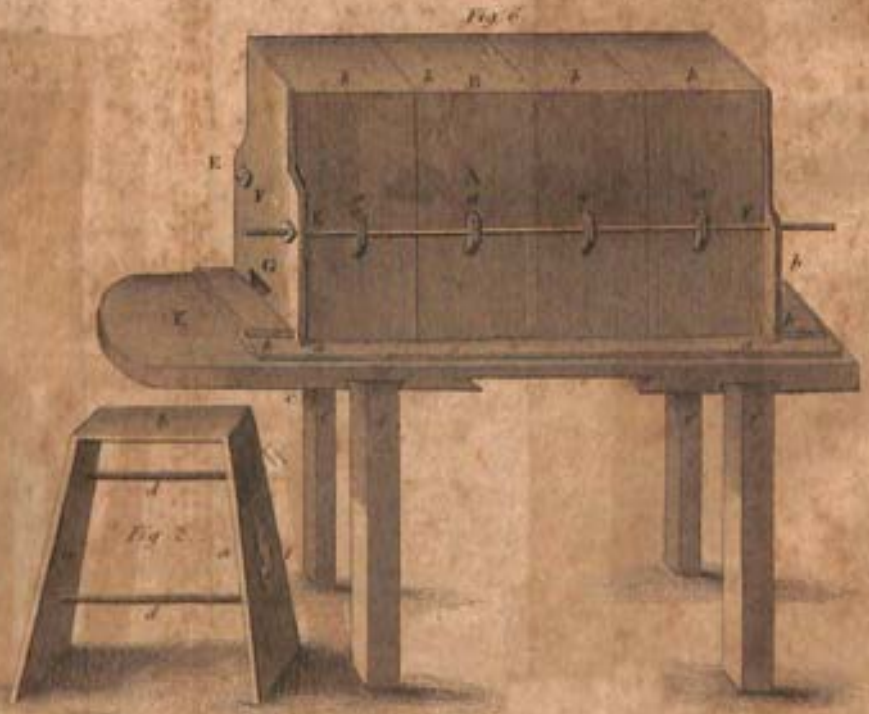
C C are two splints of deal to keep the boards even, and strengthen them.

Fig. 3, plate VI, represents the back of the Frame, d d d d are four strong boards of the same length with the frame, on which the Boxes are to be placed, let the upper side of them be very smooth and even, that the Boxes may stand true upon them, or it may be still more advisable to place under every pair of Boxes









THE STORIFYING HIVE OF MAD.R VICAT.

Published by Baldwin, Cradock & Joy, Paternoster Row, June 1814.

a smooth thin board, as long as the Boxes and about a quarter of an inch wider: the Bees will soon fasten the Boxes to this board in such a manner, that you may move or weigh the Boxes and board together, without breaking the wax which for many reasons ought to be avoided. These floors must be supported by pieces of wood or bearers, e e, which are nailed from post to post at each end. They are likewise to be well nailed to the frame to keep them from sinking with the weight of the Boxes.

F represents the roof which projects backwards about seven or eight inches beyond the Boxes to shelter them from the rain.

Niches or holes must now be cut in the frame, over against each mouth or entrance into the Boxes, at hh hh hh in Fig. 2. These niches must be 4 inches long, and under each a small piece of wood must be nailed for the Bees to alight upon.

The morning or evening sun will shine upon one or both ends of the frame, let its aspect be what it will, but it may be prevented from overheating the Boxes by a loose board set up between the posts, and kept in by two or three pegs.

Mad. Vicat, a native of Switzerland, has contributed very largely to the knowledge of the natural history of the Bee, and having observed many inconveniences attending the use of Boxes or Hives, which are placed on one another, she contrived a Hive formed of collateral Boxes, and the construction of which appears to be very simple.

Plate II, Fig. 1, A B C D represents the inside of the Hive composd of its four Boxes put together, laid on their sides a a, E E are rods with screws, which

serve to connect the Boxes of the Hive; F F mark the front and the back of the Hive; G the mouth of the fore-part of the Hive; b b are the bottoms of the Boxes seen in their insides, but more properly the tops, as they stand in the Hive, c c are notches which serve to fasten the Hive to the ledge of the table. Fig. III. d d are the rods destined to support the combs; these rods are eight in number, two to each Box, which they traverse breadthwise, e e are two screw nuts movable along the rods E E, and which serve to fasten the Boxes (more or less) closely to each other, f f are the wooden rings through which the screw-rods pass.

Fig. 2, represents one of the Boxes separated from the Hive, it shews the same parts marked with the same letters as in Fig. I, namely a a the sides, b the bottom, d d the rods and f the ring of the Box.

Fig. 3, shews the Table of the Hive seen from above A B C D, E is the fore-part of this Table: F F are hollows made in the under side of the Table to receive the legs which are nailed to it. G a groove to receive the slider of the Table represented in Fig. 5, *b b* ledges which enter into the notches, c c of Fig. 1, *a a* ledges, which fix the cover represented in Fig. 7, c c is the opening made in the Table of the Hive, in order to its being visited and cleaned by means of the drawer, Fig. 5.

Fig. 4, represents the under surface of the Table, A B C D, E is the fore-part of it. F F are the hollows of the preceding figure. G is likewise the same groove as that of Fig. 3; and *c c* the same opening as the preceding figure represents.

A, Fig. 5, represents the drawer of the Table, B B

is a linen slider intended to let air in at the bottom of the Hive, *a* is the handle of the Drawer, *b b* are the ledges which serve to secure it in the groove C of Fig. 3 and 4.

Fig. 6, A B is the entire Hive, composed of its four Boxes *a a b b*, of its screw rods E E, of its Table *a b c d* the fore-part of which is marked E, the fore-part of the Hive is marked F, and its mouth is G. The ledges of the Table are marked with the same letters *a a b b* as in the foregoing figures, and the feet f f are nailed in the notches in each side of the groove, g made to receive the Drawer represented by Fig. 5.

A B Fig. 7, is the cover with its movable circle, in which the part *e* is pierced with holes, f is quite open, g g g g g are five little arched openings for the passage of the Bees, and of the close part *d* is to shut intirely the opening g of the foregoing figure, when the weather is too cold for the Bees the screw-rods should not be made to project on each side of the Hive so much as they do in Fig. 1; but they should be as represented in Fig. 6, where they are fastened behind by means of an iron rod.

When one of these Hives or Colonies is just peopled, the upper piece, or top of one of the Boxes is taken off, and the straw Hive is placed upon the opening, putting a grate of wire in the hole, to prevent a union of the combs in the Box with those in the Hive, which would render the separation more difficult.

When a Box is to be taken away, the rod which holds the Boxes firmly connected is unscrewed. The Boxes which are to remain untouched may be secured by staples. The opening in the bottom of the piece of deal, which forms the back part of the Hive is then

to be opened, and the smoke of linen rags is blown into the Box; as soon as a judgment can be formed that the Bees, are by these means driven out of the furthest Box, the end is loosened and taken away; then the Box itself is loosened from the next, and the Combs, if they run in a longitudinal direction, must be cut through with a wire, or a sharp thin knife: if the Combs run crosswise, they must be taken out singly before the Box is taken away. The Box being then removed, the piece of Deal forming the back of the Hive, is immediately joined to the remaining Box and secured as it was before. The smoke should be kept up all the time to prevent interruption from the Bees. If the first Box is to be taken away, exactly the same steps are pursued, and if it be done when most of the Bees are abroad, scarcely a Bee will be lost.

The Hive of Gelieu, is composed of Boards of an inch in thickness at least. It is a long square, a foot in height, nine or ten inches broad, and fifteen or eighteen long; this species of Box, open underneath, is only closed by the Table on which it stands, the entrance of the Bees is at the bottom of one of the great sides. This square thus constructed is divided from the top to the bottom, in order to make two equal parts, in such a manner that the door at which the Bees enter is cut in two; the open slides are closed by two light boards, in each of these two last planks two openings are made, viz. one in the centre of three or four inches, for the communication of the Bees from one part to another, and the other at the bottom like that of the entrance, by which the Bees can communicate from one part to the other by the openings at the cen-

tre, and those at the bottom. These two demi-hives are kept united by means of eight projecting pegs, two of which placed on each side, top and bottom, in the thickness of the boards, enables the apiarian to attach an iron wire from one peg to the other, which prevents the separation of the two demi-hives.

This species of hive presents the facility of making artificial swarms, by dividing at a proper time, and adding to each demi-hive two empty parallel portions; but I do not believe that the deprivation of Honey from them is easy without extracting the Brood on that side from which the honey is taken.

The storifying hive is formed by the union, and position on each other of several pieces of the same diameter, and the same elevation, the number of which is augmented, or diminished at pleasure. This is the hive, which has been so warmly recommended by Bonner, although it was originally invented by Gelieu.* It has however been much modified by different apiarians. Some have made them of straw of cylindrical parts; others of wood, of a square or octagon form; the diameter has however in general been one foot, and the elevation of each part three, four, and five inches.†

The apiarians of France are at this time abusing each other, with all the civility belonging to that polished nation, on the merits of this particular kind of

* As the inventor, he demanded of the minister, Cardinal de Fleury, the privilege of establishing it in France. Letter of Reaumur, of the 29th January, 1757, related in the Memoirs of the Society of Agriculture of Brittany, 1759 and 1760.

† Swammerdam, who may in some respects be called the father of the storifying system, mentions that he once possessed a colony of thirty stories.

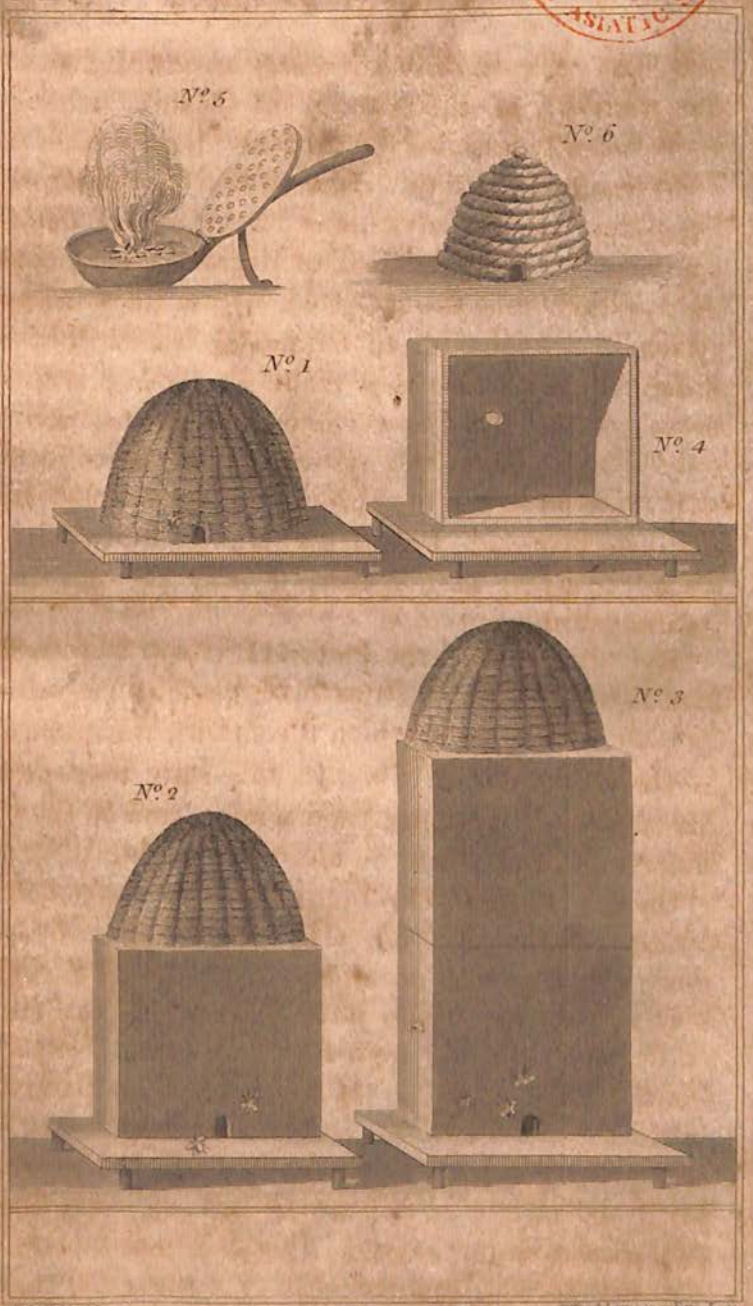
hive. At the head of its advocates stands M. Ducouedic, resident of the canton of Maure, who has been violently assailed by Messrs. Boscs, Feburier, Lenormand, and others. It is certain that the storifying system has its advantages; but I am a decided opponent to every method of deprivation by which the middle combs are molested, and in the storifying system it is impossible to obtain the honey from the different compartments without interfering with the brood combs. As I however well know that it is not only in France that this system is recommended, but that it has its adherents also in this country, and especially in Scotland, I shall give a brief description of its advantages; and, I trust, I may be allowed, of its disadvantages too.

By a reference to the Plate III. it will be seen that No. 1. is the common straw hive, placed on a pedestal or table. The Bees, which it contains, were a swarm of the 21st June, 1812. In this state they passed the summer, the autumn, and winter, and on the 21st March, 1813, it would be nine months old.

On the 21st March, 1813, the first story will be added to it (see No. 2.), and this the French apiarians call *La ruche ecossaise*, or Scotch hive. This hive will remain in the state of a single story for an entire year, that is, from the 21st March, 1813, to the 21st March, 1814. If the population of the hive has been considerable, and the season favourable during its first year, it may be expected in the second to throw off one or two strong swarms. On the return of the spring of 1814 this hive will be twenty-one months old, nine months as a simple hive, and twelve with one story.

ROYAL ASIATIC SOCIETY OF THE BOMBAY BRANCH OF THE

Plate 3.



Rob.t Hodgetts del.

T. Wm. Johnson &c. 93 Fetter Lane.

PYRAMIDAL HIVE OF DUCOUEDIC.

Published by Baldwin Cradock & Joy Paternoster Row. July 1815.

No. 3 represents the hive with two stories, and it then assumes the name of the pyramidal hive. It commences on the 21st March, 1814, and becomes pyramidal at the age of twenty-one months.

These three hives, or boxes, are plastered with mortar or clay at their junction, by which they appear to form but one and simple hive, and the Bees can only depart and enter by a single opening made in the lower story. By the means of holes bored in the top of the lower stories, there is a free communication for the Bees from one story to the other (see No. 4.).

This colony will exist in the state of a two storied hive from the 21st March to the 21st September, of the same year. It will then be twenty-seven months old. Several swarms will have been obtained throughout all the different stages, from the single hive to the pyramidal one. The swarms of the latter are considerable, especially those of the second and subsequent years. They generally weigh from twelve to twenty pounds, of sixteen ounces.

On the 21st September, either a few days sooner or later, as soon as the drones have been destroyed by the Bees, the first story of this colony can be disposed of: it will be found full of wax and honey, without Bees and brood. The honey will be of the present year, as the Bees will have consumed that of the preceding years.

When on the 21st September the first story is removed, the hive will cease to be pyramidal, and will return to its former state of the two storied hive: in this state it will pass the six months of the autumn and winter, but on the return of the spring an-

other story will be given to it, and it will then resume the name of the pyramidal hive.

The Bees of a pyramidal hive never perish by hunger nor cold. It is too rich to want provisions, and too numerous to be affected by the most rigorous winter. When the Bees are in groupes, they maintain the necessary heat in the hive, and the brood on the return of spring is always hatched one month sooner than in any other hive.

Such is the character given by Mr. Ducouedic of the advantages of the storified hive; but I do not think it will require much ability to shew that these advantages are exaggerated, and its inconveniences concealed. One of the advantages which it possesses is said to be the power of proportioning the hives to the magnitude of the swarms. This advantage is a little chimerical, because the greatness of a swarm cannot be ascertained at the moment of its settling. The hotter the weather the larger the swarm will appear. The Bees in a groupe hang to each other by their feet, and if the weather is hot they extend themselves to admit the air between them. The cluster will then appear very great; but the coolness of evening coming on, the size of the swarm diminishes in such a manner, that we can scarcely believe that it is the same.

Supposing, however, that the magnitude of a swarm can be ascertained by its weight, it will still be difficult to regulate the number of stories which ought to be given to it, because two swarms of the same day, and the same weight, will not work equally well. One will fill four stories in fifteen or twenty days, whilst another will not fill three in a whole season.

But, it may be answered, three only may be given at first, and then a fourth to that which works the best, whilst to that which is the least laborious, the three only remain. We thus fall into those minute details to which these sort of hives give rise, and for which they have been exposed to so much reproach.

An advocate* of the storying system says, "No cause exists why a certain number of stories should not be placed for several months, and even for a year; that much is gained by it, provided for this space of time the boxes are made of a convenient and proper size." To enter into the sense of this author I merely observe, that the Bees which escape, often lodge themselves in places out of all proportion to the magnitude of the swarm; for example, in chimnies, in the hollow trunks of trees, and I have known some which have lodged under the tiles of a garret for a series of years.† They work in these places, throw off their swarms, notwithstanding the disproportion of the dwelling which they occupy.

Another advantage is, to be able to gather the upper stories *full*, by substituting empty ones at the bottom. By these means the combs of these hives are renewed.

This manœuvre has an influence not only on the quality, but the quantity of the honey. In the first place on the quality, because the Bees having stored up some pollen in the combs when they were in the centre, and being able to extract it only imperfectly, the

* See Le Traité pratique de l'education des Abeilles. Vendome, 1806, No. 69.

† A swarm of this sort inhabited the roof of Dunsinnan House, in Perthshire, for a number of years, and was facetiously called by its amiable owner, "My apiary."

honey which is deposited in them, when that particular story becomes the upper one, contracts a bitterness, of which it is difficult to deprive it:* in regard to the quantity, because the capacity of the cells is diminished by the little film, which every worm of the Bee winds round itself, and which it cannot wholly extricate from the cell.†

By the use of the storied hives, it is said, that the invasion of the moth is prevented. I have, however, seen a storied hive, or colony, the combs of which were devoured by the moth, not from the negligence of the proprietors, but because there being neither brood nor queen, and, in fact, in a steril state, these hives were deprived of all defence; the invasion of the moth in the disorganized hives, of whatever form they may be, is so rapid in the month of August, on account of the heat, that it is only to be perceived by a strict and daily attention.

Another advantage of this system is said to be the facility with which the artificial swarms are made with the stories taken from the centre, which, in the season, bordering on that of the swarms, ought to contain the cells of the young Queen, or at least the brood from which the working Bees would know how to raise themselves a Queen.

* See the reports made to the Society of Agriculture of Paris, and to the institute by Messrs. Bosc and Olivier, 18th April, and 21 September, 1810.

† Swammerdam, in his General History of Insects, says, "that, in cutting some cells, the basis is found to be about the thickness of a shilling, whilst in general it is extremely thin." This arises, he says, from many films placed one above the other. Maraldi observed, during one summer, that the cells served five times for the brood of Bees: therefore in one season five films were placed on one another. See Les Memoires de l'Academie, 1713. p. 314.

I merely observe that it is not an easy operation to take the stories full of brood; it is an actual siege against the fury of the Bees. I shall have occasion to enlarge upon this point under the head of artificial Swarms.

One great inconvenience arising from the diminutive elevation of the stories, each of which is separated, is, that it obliges the Bees to live as it were in different families, whereas their own preservation, and that of the brood, necessitates them to live in the strictest union. According to this method there would be one cluster in one story, another in the second, and so on, by which the interior heat, being only in proportion to the partial junctions, would not produce the same advantageous results as when there are no points of division. I once saw an amateur who attempted to remedy this inconvenience, by making in each separation holes of fifteen lines in diameter, very near to each other; but he found that the holes embarrassed him very much when he came to take off the upper stories.

Another inconvenience is the transversal incision of the combs with the wire to separate the stories, they being placed at the lower part, to be taken away when they have attained the top. In crossing the centre the Queen has deposited her eggs in it; the brood having wound a film, which remains waxed to the sides of the cells, when the story is to be raised, the films resist the wire, and, before they will yield, the combs fall upon each other, the Bees are crushed, and, amongst them, perhaps the Queen. This inconvenience can be remedied, it is said, by cutting the combs at the sides; but then the particular direction

of the combs must be distinctly ascertained, which is not an easy matter, as there are some which are crooked. Besides, I have attempted to cut the combs at the side, and I discovered that the film prevented a clean incision.*

The upper part of these hives is on an erroneous plan, because they are necessarily *flat.* This is the rock on which the partizans of the storying system have been wrecked. The Bees in health never vent any excrement in the hive, and, being never benumbed, they continually consume their food, and consequently evacuate by a considerable perspiration, which rises in vapour to the top of the hives: this circumstance takes place during the nights of spring, at the epoch when the Queen is the most prolific, and during the days and nights of winter, when the Bees are concentred in their hive.

This perspiration is necessary during the laying of her eggs by the Queen, for the purpose of preserving the brood in a state of moisture proper to facilitate its development: the heat of the days, the motion of the Bees, and their absence attenuate the superfluity of these vapours. During winter these vapours are also necessary to a certain point, to preserve the honey in a state fit for the health of the Bees, it being ascertained, after repeated experiments, that granulated, or crystallized honey, is not salutary for Bees, nor indeed is of any great use to them;† but as in winter

* Doctor Chambon says, that the cells which have contained larvæ possess a softness which embarrasses the person who cuts, because they rather tear than allow themselves to be cut, by bending under the cutting instrument (See his Manual on the Education of Bees, note 19).

† See the experiments of Madame Vicat, in the Memoirs of the Economical Society of Berne.

these vapours are almost continual, it is proper that they should be carried off without falling on the Bees.

According to the writings of the ancients, and the form of their hives, the abundance of these vapours was not unknown to them; and it is from the principle of removing them from the centre, that they adopted the convex form of the top of their hives, in order to facilitate the flowing of the superabundant water formed by the vapours which rise to the top.

Schirach was the first who perceived these vapours. To try his experiments he had some boxes made *flat* at the top, in which he introduced some combs, containing brood of an early age, and some Bees. He soon found that the Bees perspired, and found some large drops of water at the top of his boxes.* As a remedy, he made a large opening, over which he placed a plate of tin pierced with little holes, to which he added some vent holes to assist the evaporation of the superabundant vapours, which exhaled from the Bees contained in the boxes.

In 1769 Madame Vicat, of the Society of Berne, repeated the experiments of Schirach, and by the top of her boxes, on which she also placed a plate of tin bored with little holes, she ascertained that a warm vapour exhaled, and sometimes very sensible.†

On the other hand the amateurs, astonished at perceiving these waters, attempted to attenuate them, by either making their stories of light and porous wood, or in boring holes in the separation of every story,

* Schirach's Natural History of the Queen of the Bees.—Cap. III. p. 19.

† Memoirs of the Economical Society of Berne, Letters of Madame Vicat to Vogel, 1770. It is also found at the end of Schirach's work.

which holes in the upper story are covered with plates of perforated tin. The anxiety in this respect determined many to adapt a glass to each story, in order to ascertain the effects of the vapours which were perceived. It was during the last excessive hard winter that, having a storified hive, the partitions of which were glass, I was particularly anxious about them, knowing the porosity of that material, and I examined them in the month of December, when, to my great vexation, I found a sheet of ice in the upper part of each hive.*

The question hence arises, what is the most common cause of the loss of the hives during the winter? I do not speak of hunger, for that is the fault of the proprietors; but I maintain that it is the moisture of the combs, occasioned by the fall of the water collected at the top of the hives which are flat: it is also the fall of these waters on the Bees, which, stopping their perspiration, sours and corrupts the matter which is in their body, causes the dysentery, and carries infection and death through the whole community. But, it may be said, the vapours exhale equally from the Bees lodged in hives with a convex top, and that they freeze in severe winters. This is all granted: but the convex top, receiving the waters of the steam, cannot retain them; they follow continually the declivity which conducts them to the circumference; if severe cold intervenes the waters freeze, but it is in the course of their fall, that is, against the interior sides of the circumference, and at a distance from the

* Dubost, a French apiarian, made the same discovery in the winter of 1788 and 1789.

centre. Another point is, that, for the welfare of the brood, it is necessary that it should be concentred in the middle of the hives, as being the warmest place: and that the temperature should be the same throughout the whole extent of the centre. The Bees always beginning their work in the most elevated part of their hive, naturally find this centre point. If the top be flat, and especially if it be as spacious as in the hives called pyramidal, the Bees will not find this centre; they will work one year in one part, and the following year in another: this is without doubt one of the causes which obliges a proprietor to wait three or four years, before any honey can be gathered from these hives.*

The last reason is, that fifty years have now expired since the storifying system was invented: that since that time they have been extravagantly extolled, but still they have never extended further than the limited apiary of the citizen. The country apiarian refuses to use them, although he is not acquainted with their inconveniences; but he has been shewn the hives made of wood, which are expensive and require the most minute and assiduous care: and they yield but a poor harvest in numerous portions, which is embarrassing to the proprietor, and unworthy of the attention of the wax merchant.

Keys is an advocate for the storifying system, but no person can read his sentiments on this subject without being struck by his numerous and gross contradictions. He asserts, "that the method of storify-

* Rapport des Commissaires de la Societé d'Agriculture, Sciences et Arts de Rennes, du 15 Novembre, 1809.

ing undoubtedly yields much the greatest profit," and in the very subsequent passage, he says, " that three pecks of Bees in one hive will collect more honey than a bushel divided in two." Now I would wish to ask this sapient apiarian, what is the storifying system but dividing the Bees? It may be answered, that, although divided, they are still one family. It is granted; but it is that very division which is injurious to the interests of the proprietor. The reasons of this have been already stated; but Mr. Keys must have been a very shallow apiarian to assert that the Bees, being limited to a small compass, increase more than when an appropriate space is given to them. As to a hive ever containing three pecks of Bees it is an idea that must be scouted by every apiarian: and how will Mr. Keys account for the great mortality which, according to his system, takes place in the hive, when he calculates that, of a hive which contains three pecks in the summer, scarcely a quart will remain at the close of the winter. According to this method of reasoning, twenty-three quarts of Bees must have perished during the winter. The only excuse I can make for Mr. Keys, in this instance, is, that he speaks figuratively, for he surely can never mean that a hive of Bees ever amounted in quantity to a bushel.

I shall not, however, follow Keys through all his arguments respecting the superiority of the storifying system, as its inconveniences have been already stated, and no new arguments in its favour are adduced.

A French apiarian, M. Lombard, being sensible of the disadvantages attending the storifying system, has invented a hive which he calls *the village hive*, on account of its resemblance to the common hive gene-

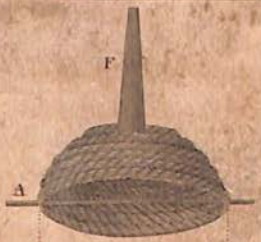


Fig. 1

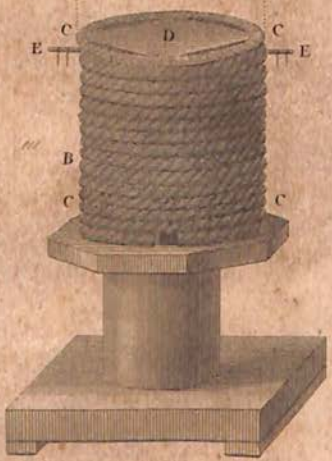


Fig. 3

Fig. 8

Fig. 5

Fig. 4

Fig. 2

Scale of 8 Feet

Robt Hasch del.

W. Woodthorpe sc. 90 Fetter Lane.

HIVE OF LOMBARD,

with Instruments of Deprivation &c.

Published by Baldwin Cradock & Joy Paternoster Row July 1823.

rally in use in the country; it differs however in this respect, that it is divided in two, and that in the interior there is a species of separation which facilitates the deprivation of the honey, without obstructing the circulation of the Bees. The convex form of the top has been preserved to facilitate the flowing of the water of the steam, which during the winter is exhaled by the union of the Bees. He discards the transversal cutting of the combs by the wire, of which he allows that he is sensible of the inconvenience, and the only difficulty which he meets with, is in detaching the upper part from the lower, which sticks together by the propolis used by the Bees to close the joint. He declares that he adopts the hive, after a trial of twelve or fifteen years of the hives of different forms.

The hive as it is above stated, is composed of two parts, the body of the hive B, and the cover A, (see Pl. IV, fig. 1.) forming together an elevation of seventeen to twenty inches, on a uniform diameter of one foot within the clear, excepting the upper part which ought to be convex. He adopted the above dimensions, because the brood is more concentrated than in the hives of wider extent. If the elevation be at all varied, it is merely to proportionate the hives a little to the magnitude of the swarms, according to the season being more or less advanced. These proportions are however seldom exceeded, because, as the too great capacity of the hives does not allow of an annual deprivation, the honey deteriorates, * and it has also

* In speaking of the too great capacity of the pyramidal hive of M. Ducouedic, Messrs. Bosc and Olivier, members of the Institute, and the commissioners chosen to examine that kind of hive, thus express themselves in their report made to the society of Agriculture of Paris and to the

been ascertained, that the hives which exceed these proportions when they are full, are beyond the strength of the generality of men, and that it is then painful and troublesome to manage them. Some amateurs have adopted a less diameter, as they may then give their hives rather a greater elevation. On this head, M. Huber justly observes "If too great a diameter be not given to the abode of the Bees, it may without danger be increased in the elevation;" their success in the hollow trees, their natural domicile, incontestibly proves the truth of this position.

The body of this hive is composed of bands of straw, similar to that of the cottager in this country. At the top and bottom of the body of each hive, an exterior band is made C C. The hive ought to be bordered without, top and bottom—that is, at the bottom to give the hive a firm station on the pedestal, and at the top, to be able to unite together two hives placed on one another, should this be necessary. At the top of the body of the hives, within the clear, and even with the last band is placed a flooring board D D, made of a light plank of ten inches in breadth in all directions, the four corners are sawed off in such a manner, that in measuring the board from one corner to another, the measurement is one foot. This board is fixed with nails inserted in the upper double band, entering a little into the front; the four openings which the board leaves are necessary for the circulation of the Bees, and the evaporation of the vapours

Institute. "It is a fact that the honey becomes coloured and deteriorates in proportion as it remains in the hive, on account of the reaction of those principles on themselves, a reaction strengthened by the great heat which reigns in the hive; the honey of the present year is always the best."

which, in the winter, exhale from their union, and for their passage, when it is necessary to smoke them. The effect of this board is seen (Pl. IV. fig. 2); it is the top of the hive viewed longitudinally. Under the board a flat rod EE, traverses the hive, projecting from the two sides, about fifteen or eighteen lines; it answers the purpose of lifting the hive with the two hands, and facilitates the fastening of the cover, which has also a projecting rod, corresponding with that of the hive. At the bottom is an opening, two inches broad, and nine lines in height, for the ingress and egress of the Bees.

The two first bands of the cover A, ought to be of the same diameter as the hive, the third ought to be insensibly contracted, and so on progressively, until the cover at its elevation is of four or five inches. At the top an opening is left of fifteen or eighteen lines, in which the dagger F is placed, one foot in length, and diminishing insensibly in its apparent height, which is only ten inches, the remainder being buried in the cover. In order that this dagger should not penetrate deeper by the weight of the outer covering, of which mention will be made hereafter, a rod a little curved, of six or eight inches length, is placed, which passes across the dagger, and bears on the convexity of the cover, and in a contrary direction to that of the interior, as is explained by the fig. 1 and 3.

The base of the covers is traversed by the projecting rod, the use of which has been already mentioned, and which also serves to support the combs which the Bees construct in the covers. It is proper to have the covers of about four or five inches in depth, that they may be proportioned to the size of the swarm.

Were they to be made of a greater depth some comb would be found which could not possibly be extracted. In the interior of the hives two bars are placed crosswise, one above the other, in order to support the combs. They are required to project a little that they may be drawn out with pincers when the hive is deprived of its honey.*

Finally, it is necessary that all the hives and all the bases of the covers should be of one uniform diameter, in order that the hives, if occasion require it, may be placed upon each other, and the covers be then fitted to all the hives.

An ingenious method has been devised by M. Lombard of constructing the hives and covers of a uniform diameter. The following is the description of it:— A piece of wood is taken (walnut-tree is the best) of about two inches thick and fourteen inches in diameter; it is rounded until it is reduced to thirteen inches, eight lines. The board is hollowed about an inch, leaving at the circumference a border of about ten

* I consider these sticks, or cross-bars, to be one of the greatest inconveniences attending the common straw hive, and also of this hive of M. Lombard. I have always found, in my attempts to deprive these hives of their superfluous store, that these sticks are the greatest impediment. As to the method recommended of drawing them out with pincers, it is perfectly chimerical; it is impossible to effect it without tearing the combs, and even the brood combs. The Bees naturally become suffocated in their own sweets, and the general damage which is done to the hive is irreparable. Even in the case of suffocating the Bees, these sticks prove an injury; for the hive must be either cut to pieces to obtain the combs in their perfect state, or the sticks must be extracted, as described above. The country people, in general, stick their hives ridiculously: one single stick through the middle being sufficient, but in Scotland, for instance, three or four are inserted. In this respect the great advantage of my hive will be apparent.

lines, which will give a diameter of one foot, from the interior edge to the other. (see fig. 4.) If the segment of the circle be not at hand, forty-two spaces are marked an inch between each; at every mark a hole is made with a small centre bit, and the band which is used to fasten the straw to the board is flat; a small red-hot flat iron of about two or three lines broad, is passed through every hole. On the border of ten lines forty-two notches are made, of two lines broad, and as many deep, at a distance of an inch from each. These notches on the border are made between two holes made in the segment of the circle. (see fig. 5.) In this state the board will be a guide for the beginning of the hive and the covers.

In regard to the glass or bell hives, they are fit only for the amateur. They have been recommended by some apiarians as excellent inventions for discovering the internal economy of the Bee. I am however convinced, that not a single discovery has ever been made by the means of glass hives. As conducive to the prosperity of the Bees, they are unquestionably opposite, and I can, with the greatest propriety, recommend them to those persons, who wish to have a little fine honey during the year, but who have no inclination to preserve the Bees for the operations of the succeeding one.

Having now examined the different hives which are in use in this country and on the continent, it merely remains for me to describe the hive, which, although its general principle is of a very early date, yet its improvements have been entirely suggested by myself.

As it has always been my invariable study to save the lives of these valuable insects, and at the same time to reap the utmost possible profit from their labours, the selection of a proper abode for them was a matter of no secondary consideration; for on this must depend the plus, or minus of success in the undertaking. Aware of the several disadvantages which are conspicuous in the construction of the various kinds of hives which are in use, I considered it possible to erect one on principles such as would obviate those disadvantages, and at the same time combine beauty with utility.

My first object was to select those materials which I judged most suitable for the construction of a hive, and after repeated experiments on the various materials, I was convinced that there was none more proper than straw. This I know is denied by Huber; but I must be allowed, in this instance, to differ from that celebrated apiarian. The shape of the hive was my next consideration. I had been so often defeated in my expectations in the deprivation of the common straw hive, and especially by the sticks with which they are necessarily furnished to prevent the combs from falling, that I was persuaded it was a shape fitted only for those persons who suffocate their Bees; but to the deprivator it was the most inconvenient and unmanageable form that could be suggested. It was a flower-pot which first gave me the idea of the shape, and which appeared to possess peculiar advantages. It would, in the first place, supersede the necessity of sticks; for the combs then acting like a wedge, being larger at the top than at the bottom, could not fall on the board. This was one

LIBRARY OF THE BOMBAY BRANCH OF THE ROYAL ASIATIC SOCIETY

Plate 5.

HIVE OF HUISH.

Published by Baldwin, Cradock & Joy, Paternoster Row, July 1825.

great difficulty overcome; but then the impossibility of extracting the combs from the bottom of the hive presented itself; for upon the same principle that the combs acting as a wedge would prevent them falling down, so it would be impossible to extract them from the bottom, as they would be smaller there than at the top. One only method therefore presented itself of extracting the combs from the top, but this I knew could not be effected, were the combs all constructed on one basis, which is the case in the generality of hives. I therefore set my invention at work to devise a method by which each comb could have its separate foundation; but I was aware of the perverse and untractable temper of the insects under my management, and that from the very spirit of opposition, which, were I inclined to be severe, I might say arises from their being under the government of a female, they would not construct their combs in the particular manner consonant to my wishes. I had tried a hive on the principle of Huber, and I found that, notwithstanding the scientific and philosophical elucidation of Mr. John Hunter, that an edge forming a salient or even a returning angle, determined the foundation of the combs of the Bees; they had nevertheless disregarded this principle, and had worked in the interstices between the frames. To give to each comb its own foundation was not a matter of any great difficulty; but in what manner the Bees were to be prevented from working in the interstices, and at the same time to be forced to work on the foundations prescribed to them, cost me some little pains to determine. It suggested itself to me that a Bee will never work on an unstable foundation, and

therefore I considered that I should succeed in my design, if I could insert any network between the pieces of wood. Having obtained eight pieces of well seasoned wood, about three inches broad, and half inch thick, I laid them equidistant on the top of the hive (see Pl. V. fig. 2.), and having fastened them to the outer projecting band, which serves as their basis, I covered them with network, over which I placed a circular board the whole size of the hive. Thus, were the Bees to attempt to fasten their combs in the interstices they would find the network, which, being an infirm foundation, would oblige them to construct the combs on the single boards. I had however now given to my hive a flat top, which I knew was injurious to my Bees, as it prevented the evaporation of the steam arising from their bodies. To obviate this, I made six holes in the circular board, which was placed upon the net, and which I closed with plates of tin perforated with small holes. (see Pl. V. fig. 4.) The whole I covered with a convex cover of straw, manufactured in the same manner as the hive; the interior form of which facilitates the flowing of the vapours down the sides of the hive, and the exterior form prevents any rain from lodging on it. This cover is well plastered down to prevent the admission of any light into the hive. At any time and season, when I require some honey-comb, or at the end of the season, when I deprive my Bees of their superfluous store, I open the top and take the side boards out, from which having cut the honey-comb, I replace them in the hive, and it facilitates the operation to have some vacant boards ready to supply the places of the full ones. This operation is very easily and

speedily performed; it has the advantage of not disturbing the middle combs, and I have often deprived these hives of their honey without the loss of a single Bee, excepting those few who were foolish enough to leave their stings in various parts of my dress. In the month of August, 1810, I obtained from one of these hives eighteen pounds of beautiful honey-comb; by the end of September the void was again filled, and I extracted ten pounds more, leaving sufficient to supply them through the winter. No. 1. Pl. V, represents the hive as it appears in my garden; and No. 3, one of the horizontal boards, extracted from the hive, with the comb pendent from it. Two very considerable advantages arise from the use of this hive:—In the first place, there is never any occasion to make an addition to the hive at the bottom, when the Bees, by lying out in clusters, declare that they stand in need of room; for the operation of depriving them of a part of their combs from the top, will give them that room which they require, and which they will soon replenish with honey. In the common hive it is customary in this predicament to place, what is called in Scotland, an eek, which consists of from four to six bands of the same diameter as the hive; but, on taking away this eek in the autumn, I have seen the most injurious consequences result to the hive. It is, in general, performed by cutting the combs with a wire between the hive and the eek, and then whilst one person lifts up the hive another draws the eek away: the hive then rests on the stool. Few persons however consider that, as the combs are cut parallel with the bottom of the hive,

they will all touch the stool on which it stands, and I have thus known a whole hive perish.

The second advantage is, that the whole of the interior of the hive is open to your inspection, and you are thus enabled to examine the devastation of the moth, or to ascertain the presence of any other enemy.

It has been considered by some that the shape of the hive has a particular influence on the labour of the Bee. During a period of nearly twenty years, in which I have been acquainted with Bees, I have been favoured with the visits of many authors who have written on the subject, and a number of amateurs and proprietors. My correspondence with some of the most skilful apiarians of France and Germany, and of Scotland, has been very extensive. The conversation and correspondence which I have had with one and the other, the perusal of all the ancient and modern works which have appeared upon Bees, few of which have escaped me, and finally my own experience and experiments have convinced me of a truth which ought to be considered as incontrovertible, by all those who do possess, or who intend to keep Bees, which is, that in general, in the natural state, there is no certain method, nor will one be ever discovered, by which a great harvest of wax and honey, and great swarms can be obtained at pleasure; these are chimeræ which it is folly to pursue, because the former depends on the seasons being more or less favourable to the secretion of honey; on the countries, which the Bees inhabit, being more or less wooded and covered with flowers, and which have a particular

influence on the fecundity of the Queen: from which arises that annual difference between the harvest of honey and wax, and the largeness or smallness of the swarms. To the same causes may be attributed why one mode of treatment which succeeded one year, will not succeed the next, although the circumstances are almost the same in appearance. It is these differences and variations which, for the period of fifty-five years, have given rise to hives of different forms and materials, which have only tended to instruct us that Bees can inhabit, work, and collect provisions in vessels of every form, from the excavated trunk of the tree, as it is used in Poland and the northern countries, to the expensive and useless glass-hive, or to the hive of Duhamel,* and where no hollow trunk of the tree can be found, in the holes of walls, in chimnies, and under the roofs. It is this species of uncertainty which is the cause of apiarians and

* In the *Memoirs de l'Academie*, Duhamel relates that the curate of Lillay-le-pelieux, having deposited a strong hive of Bees in the bottom of a subverted tub, in which he made a hole, the Bees filled the tub with thick combs, in such a manner that the deep cells resembled a goose's quill; and that Mr. Dubois, who purchased it of the curate, extracted from it five to six pounds of wax, and 120 pounds of honey. The fact comes from too respectable a quarter to be disputed; but, it is so very extraordinary, that it ought to have been accompanied with more minute details. Duhamel ought to have informed us if he saw the tub full, and if the Bees had no other entrance than the hole which the hive covered. A number of apiarians have since that time placed their Bees in tubs, buckets and perforated barrels, and the result has never been attended with the same success. Those persons who are acquainted with the disposition and construction of the combs of the hives have some difficulty in conceiving how the Bees, who always place their provision of honey at the top of their domicile, should have descended into the tub, which was a kind of cellar to them, and have collected there 420 pounds of honey. The length of time should also have been mentioned in which the Bees collected this amazing quantity of honey

amateurs soliciting information from each other. They always hope by this communication to acquire that knowledge, in which they now feel themselves so deficient. This species of fraternity is useful, because the experiments and observations which they make conduce to the advantage and improvement of this branch of rural economy. In this view I have been induced to give a description of the different forms of hives, and to place the proprietors in a state to select that which appears to them the most easy of deprivation, without destroying the Bees, and leaving them a sufficiency to support them during the winter. The natural state of the Bee may be ameliorated, and the harvest of honey and wax augmented.

CHAP. VI.

ON THE POSITION OF THE APIARY.

THE apiary is the spot in which the Bee-hives are assembled. Some are in the open air, others are contained in houses built on various constructions. In the southern countries the aspect which is preferred is always to the eastward; in the northern countries it is always to the eastward and the southward; but in England little or no attention is paid to the aspect. During a perambulation through Hampshire and Sussex I saw the apiaries facing all the points of the compass.

In the vicinity of East Grinstead I visited a farmer, who had a small apiary consisting of about five hives, the aspect of which was due north, and the hives were ranged over a pigstye. I expostulated with him on the badness of the situation, and remarked the particular dislike which Bees entertain for any offensive smell. The answer I received was, that his Bees had been in that situation for about four years, and that they were now accustomed to it, and were he to remove them, they would regret the change. I

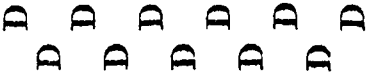
used every argument which my experience in Bees could suggest; but my labour was in vain. The Bees were attached to the north and the pigstye, and they were not to be removed.

It is certain, however, that the aspect of the apiary should vary with the climate of the country; but in this climate there can be little doubt that the aspect should be two points to the eastward and one to the southward. The variable temperature of our spring being such, that there are some days in which the honey harvest is wholly obstructed, it is prudent therefore to place the hives in that position which will enable the Bees to go early into the fields, on those days when the flowers abound with honey, because at that time they will be able to make a more abundant harvest, than when the heat of the day has absorbed the mellifluous particles from those flowers on which a multitude of other insects have alighted since the early part of the morning.

In whatever position the hives are placed they should be protected from the winds. In this country therefore a protection from the south-west is advisable. The high winds not only prevent the Bees from leaving the hive in quest of honey, but they also surprize them in the fields, and often kill them by dashing them against the trees and rocks, or into the rivers. The following anecdote is curious; it is related by the Abbé della Rocca, whose veracity in some instances is unimpeachable, but whether it be so in this case must depend on the credulity of the reader: "One day," he says, "I was sitting on the top of a mountain, on which the wind raged with the greatest violence; I saw a number of Bees which came to

gather the honey; the north-wind blew with violence, but as soon as the Bees presented themselves, they were repulsed, and their resistance was useless; fatigued with this eternal combat, many of them fell upon an expedient, which I had never heard mentioned, but of which I had read in books; they collected some little stones, and taking them up with their feet, they took their flight afresh, and succeeded in their design." *Credat qui vult.*

The hives in an apiary should always be placed in a right line, but should the number of the hives be great, and the situation not capacious enough to admit of them being placed longitudinally, it is more advisable to place them over one another than in double rows. A Bee on leaving the hive generally forms an angle of about forty-five with the horizon; the elevation of the hive should therefore be about two feet from the ground, in order to protect it from humidity. The greater the elevation of the hive, the longer is the flight of the swarm; and when they are at a certain point of elevation, the swarms are lost for ever to the proprietor.* If the hives are to be placed in a double row, the hinder ones should be at that distance from the front ones, that when the Bees take their flight, no obstruction is offered to their ascent; at all events, if the situation will not allow of the hives being placed in a right line, they should be ranged in the form of a checquer, thus:—



* In a memoir addressed to the Society of Agriculture of Paris in 1811, an apiarian speaking of a swarm that had been lodged in an elevated part

By this method the flight of the Bees in the hinder row, will not be obstructed by the hives of the front one.

The plan which is often adopted, of placing several hives upon the same bench is very injurious, and during the swarming season, it is often attended with very destructive consequences. I was once requested by a gentleman to perform an experiment upon a hive, which was placed on the same bench with six others, and in attempting to move the hive destined for the operation, the others were agitated, and the whole apiary became in a little time in a state of confusion. The easy access also which the Bees of one hive have to those of another, promotes quarrels and murderous battles. It is an erroneous opinion, though held by some skilful apiarians, that all the Bees of one apiary know each other, and that it is only the Bees of a foreign apiary with whom they quarrel. I have been too often witness of the destructive animosity of these little insects, and the wars which they wage upon the weaker hives in their own establishment, not to impress it strongly upon the attention of every apiarian, to place every hive upon a respective pedestal. In general a post is placed at each corner of the stand, as some prejudiced people believe, that a hive stands firmer upon four feet than upon one. The numerical power, I grant, is against me, but I am certain that they who have once used the single pedestal, will never have recourse again to the four-legged stool.

of his house for eighteen years, says, "this hive has uniformly sent forth a number of swarms, which however have always escaped, because the height of the place from which they direct their flight, facilitates their removal to a greater distance."

Another advantage particularly arises from the use of a single pedestal.

I have reason from sad experience to know, that the Bear is not the only animal who robs a Bee-hive; there is a two-legged animal of a more vicious disposition still, for if the Bear attacks your apiary, he is kind enough only to regale upon the honey, but leaves the hive; whereas the two-legged animal takes honey, hive and all. I had so frequently suffered from the depredations of this animal, that I determined to guard against them for ever in future. The pedestal on which I place my hive is about three inches in diameter, through which a hole is bored of sufficient magnitude to admit a chain of a tolerable size. I then place the machine over my hive as represented Pl. V, fig. 5, the two chains meet, and a good strong padlock being attached, I consider my property safe from depredators. I would however recommend that the board on which the hive is to stand, should be nailed to the pedestal in a very firm manner, but rather in a slanting direction, that a fall may be given to rain, which prevents the hive from being subject to humidity. I have however often seen that the board on which the hive stands has been made of such thin, and green wood, that it is warped as soon as the warm weather sets in; this circumstance is often attended with serious consequences to the hive, for if the whole circumference of the hive does not rest on the board, the open interstice proves a ready admission to wasps or any other predatory enemy, who being too much of the coward to enter the hive by the regular passage, are rejoiced to find any secret opening by which they can penetrate into the hive, and carry on their marauding actions without fear of discovery.

The best method of preventing the warping of the stand, is to have two strips grooved in it contrary to the grain of the wood of which the stand is made; it will thus always remain even.

Every facility should be removed by which the enemies of the Bees can ascend into the hives. In some countries of England the hives are placed extremely low, and by way of assistance to the mice, toads, and other enemies of the Bees, a piece of board is placed gradually inclining from the opening, down to the ground. In Sussex this plan is generally adopted, and as I once passed through that country I stopped at several cottages where I saw the above plan adopted, and reasoned with the proprietors on the injury which must necessarily arise to their Bees, by an adherence to such an injurious practice; but to my great mortification, the hives generally belonged to, and were under the management of the female part of the family, who were so much devoted to the old method of managing Bees, that they literally looked upon me as a person who knew nothing about the business, and my ignorance was greater in proportion, as my advice departed from the long established custom of the country. I met indeed with one person, who appeared open to conviction, and in the several letters which I have received from him, I have been highly gratified in observing that an improvement is gradually taking place in some parts of Sussex, and that this branch of rural economy is likely soon to emerge from the difficulties which have hitherto surrounded it.

The apiary should be kept particularly clean; all noxious weeds carefully removed, and no rubbish be

left in which the enemies of the Bees can conceal themselves. A few low trees or shrubs planted in the vicinity of the apiary, will be found useful in arresting the flight of the swarms, for they very often alight on espalier trees, or on currant and gooseberry bushes.

It is essential however to observe, that the apiary should not be incommoded with herbs nor plants, which rise to a height equal to, or exceeding the entrance of the hive; because the Bees on their arrival from their journeys, being much fatigued, are impeded by these plants, and regain their habitation with difficulty. If they touch these plants in passing, they often fall to the ground, and become victims to their enemies, or are unfortunately trodden under foot. These plants also serve the purpose of a ladder, for the enemies of the Bees to ascend into the hive, and especially the ants, which in some districts are particularly numerous. These little insects are a great detriment to a hive, and they baffle the most vigilant attention of the apiarian to prevent their depredations. I have found that a small leaden reservoir of water, placed at the bottom of the pedestal, is of great service in preventing the ascent of these insects.

The stand on which the hive is placed should be often cleaned, that is, about four times in a year. The first cleaning should take place at the commencement of the spring, for a great deal of trouble will be thereby saved to the Bees, who are of that cleanly nature, that they will not endure any obnoxious substances in the hive, and thus a portion of time is sometimes very unprofitably spent in clearing away extraneous matter, which the apiarian could brush away in a moment.

The vicinity of great towns is not a proper situation for an apiary. The smoke of a city is very detrimental to Bees, as the chimnies are in general the resort of the swallows and martins, who are great destroyers of this insect.

The proximity of a large river is also injurious, as the Bees in their homeward flight are often dashed into it by the high winds, or fall into it from fatigue.

CHAP. VII.

ON THE ENEMIES OF THE BEES.

MAN may be considered as the principal enemy of the Bee, although the advantage is great which he derives from its labours. The annual massacre which he makes of that insect, to obtain its provision is a sufficient voucher of his hostility.

The Bees have besides many enemies, because they are laborious, and live in abundance. In the winter and summer they are equally open to their attacks, and especially to those of insects, who have no other provision, than what they gain by plunder, and theft. The common and field-mouse, the shrew-mouse, and the rat, are not the most dangerous, as it is in the winter only that the attack of these animals is to be looked for, and this can be prevented by contracting the entrance of the hive, so as to admit but a single Bee to come out at a time. In the spring and the summer, the Bees are in sufficient force to divest themselves of all fear for that class of enemies, but being less numerous and vigorous in the cold season, and being then consolidated for their mutual preservation, these animals

profit by the occasion, and being impelled by hunger, often gnaw the hive, and having obtained an opening, devour the wax and the honey, and what they do not consume, they defile by their excrement and urine, which are sometimes so offensive to the Bees, that they leave the hive altogether. As the mouse is the principal enemy in winter, every method should be taken for its destruction. I keep constantly round my apiary some traps of the following construction. Let a pea be soaked in water, then draw a thread through it, and tying a small stick at each end, place them in the ground the exact distance of the width of a brick; the brick is then placed on the thread, and the mouse coming to eat the pea, gnaws also the thread, and the support of the brick being then taken away, it falls, and kills the mouse. For the prevention of the attack of these animals, the single pedestal for the hive is particularly advantageous, for as it is well-known that these animals cannot proceed in a reverted direction, the difficulty of attaining the hive is very great; and it is only by some neglect on the part of the proprietor in leaving some object near the hive, by which the animal can ascend, that the interior of the hive can become a prey to its depredations.

It is the great spiders only which dare attack the Bees, which are caught in their web, and even then it is done with the greatest precaution. The spider has no attachment to the honey, although it has been asserted by some writers; they are voracious and carnivorous insects, and if they succeed in gaining admission into the hive without the knowledge of the Bees, they lodge themselves in the corners, where they spin their web, and catch those Bees who are so impru-

dent as to allow themselves to be entrapped; the havoc which they make is too inconsiderable to affect the population of the hive, but the Bees who cannot accommodate themselves to this uncleanliness abandon their hive, if they be not soon delivered from the intruders.

It is during the winter that the spiders introduce themselves into the hives without being perceived by the Bees. The entrances are too well guarded in summer to allow of their admission, and they are themselves at that season so full of vigour and courage, as to be well able to defend themselves. When the hives are cleaned, it is very essential to examine the interior, in order to extirpate the spider, which extends its web generally in the corner of the hive, and which cannot be removed by the Bees themselves.

The Wasp is a terrible enemy of the Bee during the summer months. It has been asserted by some writers, and especially by the French apiarians, that the Wasps devour the Bees: this is however perfectly erroneous, it is the honey only, which is the aim of the Wasp, and I never saw a Wasp enter a hive, that did not shew the coward immediately on being attacked by a single Bee, and his whole endeavour appeared to be, to effect a good retreat. I am however convinced that the Wasps have the instinct of discovering a weak hive, and the attack on it then becomes so furious, that the Bees are constrained to quit it, and leave the conquerors in quiet possession of their prey.*

* I have a letter by me, dated Paisley, September 12th, 1814, in which it is said, "many of the hives in the county of Renfrew are already killed by the Wasps, which prevail very much this season; and many of the Bee

It is in the spring that the apiarian should be active in preventing the increase of these marauding insects. About the month of March, or April, the Queen Wasp emerges from her winter habitation, in which she has resided in a truly hermit-like manner, and then immediately commences to build her habitation. For every Queen Wasp that is destroyed at this season, a whole nest is exterminated in embryo; and I was once so fortunate as to destroy twenty-nine Queen Wasps in one morning. They are easily known, as being much larger than the common Wasp, and more brilliant in colour.

I do not know a more efficacious method of destroying a Wasp's nest than by sulphur. They are found in banks, decayed walls, and are often seen pendent from gooseberry bushes.

Independently of the personal enmity which these two animals entertain for each other, there is another very cogent reason why the apiarian should be solicitous to destroy the Wasp. It is an insect that lives by rapine and plunder; its food is the sustenance of the Bee, and wherever the Wasp abounds, it is a natural consequence that the Bee must be deprived of food, in proportion to the number of Wasps which must be supported. In this respect the common Humble Bee should also be destroyed; indeed I consider the finding of a Humble Bee's nest as no mean treasure, for as they are like the common Bee, great hoarders of honey, I always rob them of their labour, and give it to my Bees, who banquet on it with truly epicurean gluttony. I formerly stationed a boy in

hives which remain, are so much reduced by the ravages of the Wasps, that they are of little or no value."

my garden to kill all these insects, but experience taught me that it was better to look for their nests, and rather rob, than kill them, I thereby added to my own riches; but like many other people in this world, I did not hesitate much upon the means by which that addition was effected, for I certainly obtained it by the crime of murder.

The method recommended by some apiarians of stopping up the holes of the Wasp's nests, as deeming it sufficient to destroy the Wasps, is altogether fallacious. It is wonderful in what manner those insects will work their way through, what might be supposed an impenetrable barrier; besides, it often happens, and especially when the nest is in an old wall, that there are several outlets to it, and therefore the only certain method of destruction is to penetrate to the nest, and suffocate the inhabitants with sulphur.

It is a remark which I have universally made, that the season which is favourable to the increase of Wasps, is also favourable to the increase of Bees; and this is in one respect very fortunate, for were the Wasps to increase in an undue proportion to the Bees, the destruction of the latter would be inevitable.

It is in the months of September and October, that the attack of the Wasp upon the Bee is mostly to be dreaded. The flowers have then ceased to yield their nectarcous juices, and the Wasps finding themselves pressed for food, fly to attack the magazines of the Bees. If a strict watch be not kept at this season, a hive may be ruined before the proprietor is aware of it, and he will then have only his own inattention and negligence to accuse, for the loss of his valuable property.

Many persons are in the habit of suspending bottles filled with honey and water on the trees in the vicinity of the hives, for the purpose of killing the Wasps; but this is like hanging out cards of invitation to them, for on coming to partake of the feast which is provided for them, they discover that a much richer repast is in the vicinity, and having been sworn at Highgate, they will never feed on honey and water, when they can procure honey itself.

In some of the American and West India Islands, some travellers relate that Bees cannot be kept, on account of the number of Wasps, which swarm so numerously as totally to destroy every hive.

Toads may be considered as great devourers of Bees; when the hot weather sets in, and the Bees from the increased number in the hive, and the consequent perspiration, lie out in clusters, the toads will repose during the night under the hives, for the purpose of catching the Bees as they accidentally fall. I once discovered one of these animals waiting for his prey, and I consequently immediately despatched him. I had then the curiosity to open it, and I had the mortification to find the bodies of nineteen Bees in its stomach. The toad is also particularly partial to the Wasp. As I invariably destroy every Wasp's-nest which I find, and as the evening is always the time selected for that purpose, I have often on arriving at the spot found a toad at the entrance of the nest, waiting for the Wasps coming out. On mentioning this circumstance to a great naturalist in Edinburgh, he assured me that it was the fragrance arising from the nest which attracted the toad, and that its visit was not for the purpose of slaughter: I however at a

future time convinced him that his opinion was founded on error, for one evening we opened a toad and found undigested Wasps in its stomach. In what manner this animal guards itself from the sting of the Wasp or Bee, I have never been able to ascertain. There may be that affinity between the constitutional parts of the two beings, that the venom of the Bee or Wasp, has no influence on the toad,—but I should rather conjecture, that the toad entraps the Bee, or Wasp by the head, and divides it near to the extremity of the body, where the sting is placed. I have however seen a Wasp march over the body of a toad, without the latter shewing any propensity to seize his prey; but it must be observed that most animals, as soon as they are conscious that they are noticed by man, appear to be under the influence of that fear, which prevents them following the usual dictates of their nature. It is mentioned by some authors, that the toad, in seizing its prey, gathers itself together and makes a spring upon its victim; I am however convinced of the contrary, and believe that from the slowness of its gait it comes, as it were, unperceived upon it; at all events, it should be the endeavour of the apiarian to destroy a toad wherever he meets with it; and in the day time, the new-turned earth in the garden is the best place to find them, in which they conceal themselves, with only the head projecting out of the ground: their resemblance to the colour of the earth makes them however very difficult to be perceived.

The woodpecker is a very destructive bird to Bees. He will often be seen hovering about the hives; but it is not close to the apiary, unless he is much pressed by

hunger, but in the fields, that this bird commits its depredations. At the time when the honey-dew is on the oak, and the Bees are busy sipping the sweets, this bird falls suddenly upon and devours them. This bird is easily shot, as its presence is announced by the noise which it makes in piercing the trees with its beak, to obtain the worms and maggots deposited under the bark, and whilst it is busy in its operations it becomes the easy prey of the vigilant apiarian, who should always be on the alert to protect his Bees from their enemies.

In time of snow and frost, I once saw a woodpecker perched upon one of my hives, expecting no doubt to catch the Bees as they came out. I however prevented him from troubling my hives again, as in a short time he formed a dainty morsel for my cat.

The tom-tit is also a terrible enemy of the Bee; this bird, of which we are acquainted with twenty species, is too well known to require a description. It often alights on the bushes and shrubs in the vicinity of the hive: and Buffon says "that, with its beak and claws, it provokes the Bees to come out, and then immediately seizes them. I must however confess that I never saw a tom-tit perform that operation, yet I am convinced that it is a great destroyer of Bees, and that their nests should be destroyed wherever they are to be found." Lapoutre, a French naturalist, assures us, "that he saw under a tree, in which there was a tom-tit's nest, a surprising quantity of the scaly parts of Bees, which these birds had dropped from their nests."

The ant is another enemy of the Bee, but its attack is never that of physical strength; against this

act the proverbial prudence of the ant is a sure guarantee. It was the opinion of Reaumur, that the ants, although they are particularly fond of honey, dare not enter an inhabited hive, supposing it to be in full vigour. Their diminutive size however gives them the power of effecting their entrance into the hive without being perceived by the Bees, and then the havoc which they make amongst the combs is indescribable. To preserve my hives from these vermin I always fasten a piece of sheep's skin, with its wool on, round the bottom of the pedestal, or I have found that the reservoir of water, which I have already mentioned as a preventive to the mice, possesses also the advantage of impeding the ascent of the ants.

The destruction of the ants' nest is very easily effected by boiling water: this operation must be performed either at night, or in the morning, when they are all assembled. It has also been remarked, that these insects dislike both garlick and shalots, and that they will not harbor in the ground in which those vegetables are grown. This method of removing them is very easy. They love to conceal themselves under the straw tops with which the hives are covered, to protect them from rain, and they will even form their nests in that quarter, if not prevented. When this is perceived the top of the hive should be cleaned, and a root of garlick or shalot being deposited will make them change their quarters.

When the Bees forsake a hive it is generally taken possession of immediately by the ants, and for this reason every method should be taken to destroy them.

The wax moth* is the most redoubtable and dangerous enemy of the Bee. It is the caterpillar which gnaws our trees, paper, books, in short, every inanimate matter which comes within its reach.† It has a particular predilection for the wax of our hives, in which it experiences a congenial heat, and which encourages its multiplication and growth. The combs of the Bees would soon be destroyed by these insects, if the Bees did not offer such opposition to their ravages, that the moths can only invade those hives which are not properly guarded by the Bees, and which are on the decline.

The butterfly of this vermin appears about the hives in the month of April, and it is observed until, and during the whole of October. This butterfly is of the genus phalenæ, which only fly in a mild light, such as that of the morning and twilight, or in nights which are brilliantly illumined by the moon.‡ Its

* Entomology designates two species of wax moths; the greater is the most common, *galleria cereana*; and the smaller, *galleria alvearia*. Reaumur has designated them under the name of *fausses teignes* (false moths), to distinguish them from the red moths, the caterpillars of which enclose themselves in cases, which they transport with them, whilst those of which we are now speaking construct themselves immovable edifices, in which they place themselves under cover.

† I enclosed two hundred moths in a chest without a particle of wax, but with some paper. They devoured the paper, pierced the planks of the chest, and spread themselves in a small medicine chest. They eat the manna, unguents, corks, they touched every thing, excepting some propolis, which I had amassed. With these aliments they did not attain to the same size as if they had been fed on wax. The butterflies of them were also smaller.

‡ Buffon says, that we must not consider that the vision of those animals, which are accustomed to a moderate light, can perform its functions with the total deprivation of light, or that it can penetrate the most profound darkness. When the night is fully closed these animals also cease to see.

wings are flat, of a darkish grey, with some blackish spots. Its eyes are of so great a sensibility that the light dazzles it, and it remains immovable on that spot where the light of the day has surprised it. The female profits by a little light to introduce itself into the hive, and deposits its eggs on the side of the combs. From every egg a smooth caterpillar bursts forth, of a pale white, its head brown and scaly. It encloses itself in a little web of white silk, which it attaches to the combs, and in which it finds its food by projecting its head beyond its case. When the food around it begins to fail, it prolongs its silken web, which, though at the beginning was a mere thread, becomes almost insensibly of the size of a quill. This insect, having attained its point of growth, submits to the metamorphoses common to all caterpillars: it quits its residence, returns to a corner of the hive, or departs from it; spins a white covering, emerges as a butterfly, copulates, and re-enters into the hive to deposit its eggs. During fifteen or sixteen years, these noxious vermin have made me lose annually a fifth or sixth part of my hives; but since 1808 I have collected a series of observations on this moth, which have convinced me, 1st. That its butterfly penetrates into all hives, whether weak or strong, probably by means of its wings, or by the celerity of its gait, for it runs oftener than it walks. 2d. That the female never lays her eggs in the centre of the combs of the Bees, but at their extremities; that the caterpillar is there hatched; lodges itself and grows to a certain point at that particular season of the year, when the Bees, having no brood to tend, remain inactive in the centre, in order to maintain the

heat necessary for their mutual preservation. 3d. That during this time some of the caterpillars arrive at the crisis of spinning their web in the nooks, which they find in the interior base of the circumference of the hive; and that the Bees, on perceiving these cocoons, cover them with propolis, which however does not prevent the butterfly emerging from it. 4th. I am also convinced that in the spring, during the time when the Queen is most prolific, and is most busily employed in laying her eggs, the Bees returning to their activity, and running continually over the interior of their hive, in the fulfilment of those duties which the brood requires, and in the collection of provisions, which at that time are in abundance, eradicate a great number of these moths from their domiciles, and drag them out of the hive.* But the activity of the Bees decreasing, after the Queen has finished laying her eggs, the moths which survive, and the butterfly of which appears for six months in succession, always succeed in laying their eggs on the combs the most distant from the centre. The Queen dying, or becoming infirm, the Bees having no more brood to tend, and resting in a state of inactivity the moths, by degrees, reach the centre, devouring the combs without any obstacle, and the wax and honey are consequently lost.

It has been said that burning torches ought to be placed near the hives, in which the butterflies would consume themselves; that the hives ought to be sprinkled with urine or salt, or vinegar: all these remedies are however impracticable. The former

* Reaumur says, that there is a time when the Bees appear to wage war on the moths.

would be dangerous to the Bees, inasmuch as, attracted by the light, they would come out of the hive, and fall into the snare designed for their enemies.

During an excursion into Hampshire, accidentally walking in a village, I observed a little garden splendidly illuminated with flambeaux; and on inquiring the cause, I was told that an old lady, who kept Bees, was frightening away some hobgoblins, who had attacked them. Though not a female, my curiosity was powerfully excited to behold these Hampshire hobgoblins, as it was a species of enemy to the Bee, which, with all my experience, I had not hitherto met with. *Sans ceremonie* therefore I entered the garden, and by the wild stare of the old lady I suspected that she considered myself one of the hobgoblins. I, however, soon contrived to convince her of the contrary; when she informed me, that her hives were much infested with the moths, and she had been told that, by placing lights in the vicinity of the hives, the moths would be attracted to them, and burn themselves. I smiled at the remedy; and, taking her to the hives, I shewed her that her Bees were all in commotion, and some were on the wing, which would be inevitably lost. This alarmed the old lady, and the lights were extinguished. On the following morning I visited my antiquated apiarian again, and we found fifty-seven Bees on the ground, which had been burnt on the preceding night A remedy against the ravages of these insects is very difficult, and the only advice I can give on this subject is, that whenever a person has any reason to suspect that his hives are devoured by the moths, to join the Bees to another hive, and save the little which the moths may have left him.

I would always advise an apiarian to fix his attention particularly on a hive the Bees of which appear to be in inaction, whilst the Bees of the other hives are in activity. If this inaction continues for ten days, or a fortnight, not a moment then should be lost in examining the hive, and the ravages of the moth will soon present themselves. It is useless, in this case, to attempt a cure; and if the Bees are saved, it is all that can be expected.

The death-headed sphinx (*sphinx atropos, Linn.*) is a great butterfly, and belongs also to the genus phalenæ. It is one of the most formidable enemies of the Bees, as it alarms them very much, and, in a short time, probably in the space of a single night, will rob them of a great portion of their store. This butterfly emits a sharp and plaintive sound, which with the spot on its breast, rudely representing a death's head, gives rise to its name. By the common people some most superstitious ideas are attached to it. It feeds on the leaf of the potatoe, and appears in the month of September: it is confounded with the bat, on account of its size, and because it flies at the same hour. As soon as the Bees perceive its approach, they are all in commotion, and retreat into their hive.

It now falls to my lot to notice one of the most extravagant and absurd fancies which ever entered into the head of a rational being. M. Lombard, speaking of this sphinx, says, the art which the Bees employ in rendering ineffectual the attacks of this insect is so extraordinary, that the Vaubans of the present age might take their models from them:—

"When they see," continues M. Lombard, "one of these sphinxes approaching, they immediately retire to the very extremity of the hive, contracting the entrance with a mixture of wax and propolis." They sometimes erect a double wall! then a covered way! then a secret gate! and then battlements—bastions! glacis! and counterscarp!* And can it be credited that Huber has, in the twenty-seventh volume of the Bibliotheque Britannique, actually given a draught of the fortifications which the Bees make on this occasion: and he closes his description with this sublime apostrophe, "how has this foresight been accorded to those creatures, which, as we believe, have not received the gift of intelligence! These observations are continual hymns of adoration addressed to the Author of all things."

I would not utter an unseasonable pleasantry on a human being, on whom the hand of Heaven was heavily laid. M. Huber was blind; some romantic and perverted vision of his servant must have created these fortifications, and they must have been reported to his credulous master with the same enthusiasm as Trim reported the attack of the enemy to my uncle Toby in his sentry-box, on the Bowling-green. The fault was not with thee, honest Huber; but that a naturalist of the present day, who has dared in an authoritative tone to question the system of others, should be himself so weak as to consider the fortifications of the Bees as real, deserves to be recorded as another instance of mental imbecility being often the attendant of genius.

* In the edition of Huber just published at Paris, in two vols 8vo, these fortifications are more minutely described.

On this subject M. Lombard further says, "that in the month of Septe..ber, 1802, my hives were almost wholly closed by the Bees; but I did not know to what cause to attribute this singularity. M. Huber has informed me of the cause, and the effects of which can only be prevented in those countries where potatoes grow, by closing the hives from the commencement of September."

Now I should have expected from Mr. Lombard that he would have mentioned the state in which he observed the fortifications of his Bees, and whether any mine had been prepared to blow the death-headed sphinx to the d—l whenever he appeared at their gates. This however is all omitted, and I suppose from a particular reason, which it were here superfluous to state.

Amongst the larger quadrupeds the Bee can also reckon its enemies: the fox,* the bear,† and the

* Speaking of the fox, Mr. Ducarne says, these rascals of foxes eat the Bees as well as the honey; but it is the honey to which they are most partial. For two years a particular fox came every winter to overthrow my hives. I put a chicken and some bread to amuse him, and some poison to kill him; but, no, the cunning thief would not touch either, he went directly to the hives. Mark the sagacity of the animal; he would not come in summer when the Bees were in full vigour, as he knew in what manner he would be received; but he steals slily to the hives when the inhabitants are in a state of torpor, and thus obtains their treasure without incurring any danger himself.

† In the north of Europe many of the nobles ground a cruel amusement on the passion of the bear for honey. They confine a cat in a small barrel, which they rub over on the outside with honey, and in which they bore some holes, through which the cat can extend its paws. They place the barrel in the middle of a place which they call *Palkun*; the bear is unchained, and he immediately runs to the barrel to lick the honey: the cat, believing that the bear is coming to devour her, scratches his tongue, on which the bear grows furious, and hugs

badger, have truly an epicurean taste for honey. The former however is seldom known in this country; the second is fortunately not known as indigenous, and the latter but rarely. In some countries however they are very formidable enemies, and in some parts of France the fox appears to like honey as well as he relishes a chicken, or a turkey in England. In regard to the bear, the Abbé della Rocca mentions some singular traits of sagacity. It appears the bear seldom attacks a hive openly, from a fear of the stings; but he will in the most gentle manner take a hive in his paws, and carry it out to the first river, or pond, in which he plunges it until the Bees are drowned. The proprietors therefore in those countries which are frequented by bears attach their hives to walls, and other places, from which the bears cannot tear them. It is certain that amongst the feathered tribe, the common domestic poultry are great destroyers of Bees; but in this case it is the fault of the proprietor if he ever admits them near his apiary.

The sparrow also preys upon Bees; and it is singular that in Turkey, where the culture of the Bee is much practised, that a house is never built without building at the same time, in the upper part of it, an apartment for the sparrows. They even give to these apartments a degree of elegance.*

the barrel to his breast in order to break it. Seeing his efforts in vain, he throws the barrel into the air until it breaks, when the cat runs away, or is sometimes devoured by the bear.

* In the travels of Sparrman in the Hottentot country, the following interesting description is given of a bird, which is called the *honey-guid*: It is rather larger than a sparrow, is very fond of honey, and it points out in the most sagacious manner the nests of the Bees to the bears. When these brutes destroy a nest of Bees, this bird feeds voraciously upon the

The lizard and the common newt also devour the Bees. In the islands of the Archipelago the former animal is considered as truly formidable, and as the time of its visit is generally known, a person is usually in readiness to shoot it.*

I cannot too strongly impress it upon the minds of every apiarian, who wishes to reap any profit from his hives, to be constantly upon the alert to effect the destruction of those enemies, by which his property is so materially injured. Let him remember, that they carry on their depredations in secret, and that in this instance as well as in every relation of life, a false security is the most dangerous situation in which a person can repose.

honey which is spilt. As soon as it has discovered a nest of Bees, it looks out for some companion to attack it. It entices by its piercing cries a bear, and conducts it to the vicinity of the nest. The bird flies before it, and rests at intervals, awaiting its companion in the chace, and exciting it by fresh cries to follow it. But, in proportion as it approaches the nest, it shortens the space of its stations, and its cry becomes less frequent. If, sometimes impatient of arrival at the nest, it has left its companion far behind it, it returns to him, and appears, by its redoubled cries, to reproach it for its slowness. Being arrived at the nest of the Bees, it alights and rests quietly on a neighbouring tree or bush, awaiting the end of the expedition, and that part of the booty which belongs to it. The Hottentots never fail to leave it that portion of the comb which contains the eggs and young, of which this bird is more voracious than of honey itself. M. Sparrman having offered to the Hottentots who accompanied him an ample recompense of tobacco and glass beads, if they would assist him in catching a *honey-guide*; they rejected his proposal, saying, that this bird was their friend, and they would not betray it.

* In Germany the stork is a great enemy to the Bee; but as it is not a domesticated bird in this country, the mention of it would be irrelevant

CHAP. VIII.

ON THE MALADIES OF THE BEES.

I ACKNOWLEDGE that it is difficult to obtain a precise knowledge of the nature of the maladies with which Bees are afflicted, and consequently the difficulty of finding the means of remedy is in the same ratio. It must however be admitted, that the case is not impossible; for were it so, the naturalist would be disheartened in his experiments, and no effort would be made to prolong the life of these valuable insects. Still it is my opinion that he, who is rich in hives, will find it to be his interest to rid himself of those few which appear to labour under any particular malady; but to him who is not an opulent capitalist in this species of property, every method should be pointed out of curing the diseases with which his Bees may be afflicted, by which he gains that experience which may be valuable to him in his future undertakings.

Of all the maladies to which the Bee is subject, the dysentery is the most frequent and dangerous. Every amateur of Bees, who has written on their culture, maintains a different opinion of the cause of this malady, and consequently of the most efficacious remedy to be employed. When in a healthy state the Bees never emit any excrement in the hive; if they have been confined for a length of time by a

continual frost, on the first opportunity which presents itself they leave the hive, and void a yellowish red matter, of a fetid smell, which is the natural colour of this excrement. On a day of December, when the sun shone bright, I have visited my apiary, and seen my Bees circling the air in great numbers; my clothes however, during the short time of their recreation, have been literally covered with yellowish spots, and which had rather an offensive smell.

What opinion however must be formed of the practical knowledge of a French apiarian, M. Ducouedic, who asserts that the Bees void no excrement at all; and that they do not even possess the organ necessary for its emission. Every thing he says, which enters into the body of these insects for their nourishment is never emitted *by any other channel than by the mouth*, and is converted either into honey, wax, or propolis. When they are afflicted with the dysentery, it is then even by the mouth that they disgorge the substances, which have been corrupted in their stomachs, instead of being converted into one of the above three substances.

Further, he says, the Drone even, who has no sting for its defence, never voids any excrement. The new food, which it takes, *is converted into wax* in its second stomach, and is disgorged by the mouth. The opening which is observed in its posterior extremity, is nothing more than the orifice of the sheath of the organ proper for the fecundation of the eggs of the Queen. Even the Queen herself never emits any excrement. The orifice of the organ which is perceived at her posterior extremity, is merely for the purpose of the laying of her eggs."

I ought to make some apology for the introduction of this most absurd and unnatural system, but its author deserves to be lashed with the utmost severity, for the little mercy which he has shewn to Huber, who dared to advance a contrary opinion.—He says, "that, as Huber was blind, he supposes that he smelt at the excrements of other animals in the vicinity of his hive, and thence concluded that the Bees emitted their's in a similar manner." M. Duconedic, promises another edition of his treatise on Bees, and I hope he will then retract his sentiments on this subject.

The apiarian may know when his Bees are infected with the dysentery, when he perceives in the interior, and at the entrance of his hives, large spots, like linseed, of a colour approaching to black, and of an insupportable smell: this malady is contagious. The Bees being afflicted with it, have not the strength to retain their excrements, and suffer a viscid matter to fall on the Bees below, which spoils their wings, and stops the organs of respiration. This is however, only one of the causes to which this malady is attributed. By some authors it has been ascribed to the new honey which the Bees eat in winter; by others to the deficiency of propolis, or bee-bread, and which is regarded as an essential part of their food, and by others to the flowers of the elm, or lime on which they collect their honey; not one however of these opinions has been proved. The only experiment which deserves attention is one made by M. Reaumur, who fed, for a certain time, some Bees which he kept confined, entirely on honey: they were all attacked with the dysentery; but M. Reaumur has not defined, by this experiment, whether the malady was owing to the

Bees being deprived of propolis, or to the principle of the malady which developed itself during the experiment, or to the alteration of the air, which the Bees were obliged to respire during their confinement.

I am inclined to believe in this instance, that the malady arose from the too long confinement of the Bees in the hive, for I never experienced that my own Bees or those of my neighbours were attacked with this dangerous malady, except towards the close of the winter, and at the beginning of the spring. Two reasons confirm me in this idea; the first of which is, that after the winter, during the second or third days of the appearance of the Bees out of the hive, they are seen to void an excrement of a yellowish red colour, and with which their stomachs are always filled. This appears to me the more probable, considering that the majority of the Bees, if they have only been confined for a short time, even for fifteen days, display the same phenomenon. I am therefore inclined to believe, that the Bees which are attacked with the dysentery, are those of the weakest constitution, and the disposition of which was not found sufficiently good to maintain the excremental matter for any length of time in their bodies. This matter would without doubt become in time corrupted, and those Bees which are not of a sound constitution, cannot resist the effects of it, and are attacked with that malady, which is called the dysentery. I am in a great degree borne out in this hypothesis, by the circumstance, that in the infected hives, the excremental matter has changed its colour, and instead of a yellowish red, it is become almost black, and of a most offensive smell. This is the most unfavourable symptom of an infected hive.

There is no doubt that all these causes can sometimes concur, singly or together, in producing this malady in the hives, but it is also my opinion that the Bees may be afflicted with it from some fault in the pasturage, that is, from some pestilential dew with which the flowers are infected, which consequently taints the honey and the propolis, on which the Bees feed. This opinion is founded on analogy; for quadrupeds, particularly sheep, who feed on herbs, whilst the dew is still on them, or which are decayed, are subject to the dysentery; even men who eat grapes, or other fruit are subject to the diarrhœa.

Many remedies have been prescribed by various authors for this malady: I consider it however incurable, though its prevention may be effected. As soon however as I perceive any of my hives infected, I give them a little of the following composition; and I have invariably found that it has checked the malady when administered at an early stage, or that it has strengthened the Bees, and enabled them to void those noxious substances, which have acquired a degree of corruption in their bodies.

To a quart of old wine, add a pint of honey, and two pounds and a half of sugar; put the whole in a tin saucepan, and let it boil gently over a slow fire, skimming it at different times, until it is reduced to the consistency of sirup. It may then be put into bottles, and kept in the cellar, to be used as the occasion requires. Whenever it is administered, it must be gently heated, until it partakes of the consistency of honey.

M. Ranconi, an Italian author, recommends the placing of small plates in the vicinity of the hive, filled with fresh urine; or he has found the following reme-

dy very efficacious.—Boil some old sweet wine with an adequate proportion of sugar, to which add some cloves and nutmegs, and some dried rose leaves; the bark of pomegranates well pounded and sifted, and mixed with honey and sweet wine has been found very conducive to the health of the Bees.

M. Lombard, transmits a curious remedy, which is that of smoking the Bees. He takes an earthen or iron vessel, in which some very live coals are put, on which are thrown some shreds of white linen, or pieces of calf's dung well dried. The linen shreds must not however flame, but only smoke. When the smoke is at the height, the hive is raised, and the vessel is held under it for about half a minute. M. Lombard says, "that it is very seldom that this smoke did not remove the dysentery:" with great deference to the apiarian skill of M. Lombard, I consider this remedy as possessing no intrinsic virtue; and a little reflection would have convinced M. Lombard, that an interior malady arising from corrupted food, or from an unnatural retention of the fæces, is not to be cured by an exterior application; but this is not the only remedy of M. Lombard, that ends in smoke.

M. Duchet, in his Treatise on Bees, asserts that the dysentery generally proceeds from famine and hunger, and also in the spring, when from a deficiency of honey in the hive, and in the fields, the Bees are reduced to the necessity of eating the farina of plants, and drinking snow-water.—He recommends generous Wine as a certain cure, and good old port mixed with honey, as the most proper medicine.

Wildman recommends the sprinkling of common salt well pounded on the stand; but Keys suggests that

the diseased stocks should be taken as soon as discovered into a warm room, and the parts of the combs which are black and mouldy, should be cut away. I cannot conceive what effect this operation can possibly have upon an internal malady of the Bees; but Keys is in general so very deficient in his knowledge of the natural history of the Bee, that it is not surprising that he commits an error in prescribing a remedy for a disease, with the nature of which he is wholly unacquainted.

The prescription of Wildman, I have great reason to believe is founded on truth and experience, for it is certain that Bees have a great partiality to saline waters, having myself observed them in great numbers drinking from the drains of stables, or from the cesspools, into which the urine flows. This may however proceed from an instinct of nature, which teaches them to have recourse to certain substances as a cure for the maladies with which they are afflicted, in the same manner as the dog eats grass; for it is certain, that the Bee in a healthy state prefers a running water to a stagnant one.

The dysentery is less prevalent by the sea-side, than in the inland countries; and this corroborates the opinion, that salt is beneficial to the Bee.*

Through every stage of this disease, the proprietor should pay particular attention to the cleanliness of his hives. I am certain that its ravages may be arrested

* In the memoir on Bees by M. L'Abbé Bienaimé, he recommends that oatmeal should be given to the Bees labouring under the dysentery. This recipe having but lately fallen into my hands, I cannot determine its virtues; I am not however inclined to attach great faith to it,—nor am I willing to reject it as useless, until the experiment has been tried. The result shall be made public.

by a proper attention to this advice. It is self-evident that the accumulation of the fœces on the stand of the hive, must add to the virulence of the disease, by the pestilential vapours which must arise; the stand should be cleaned therefore every morning, and washed with salt and water: some persons recommend an infusion of odoriferous plants; but the advantage of this application is to me most questionable, for I never discovered that the Bees had any predilection for particular odours, although they have a great aversion to noxious smells.—The admission of fresh air into the hive, is generally attended with success; the humidity becomes absorbed, and the foul air is dispersed.

In regard to the disease of the antennæ, it is very seldom noticed by apiarians. It has not however escaped the observation of Schirach, Rosier, and some others. It is a consequence of numbness, inactivity and idleness; but it is singular, that I never observed this malady at the end of the winter, which is the period when the Bees are the most indolent, but in the fine days of May I have seen the working Bees very much afflicted with it. It is known by the extremities of the antennæ assuming a very yellow colour, the end rather swelled, resembling the bud of a flower just ready to burst; the fore-part of the head is also rather yellow.

M. Ducouedic considers that this disease arises from the farina of the bloom, with which the Bee literally covers itself when that shrub is in flower; but Mr. D. forgets to mention why the farina of this plant has the noxious quality of infecting the Bee with this disease, and on what particular circumstances he founds his hypothesis. It is easy to assert a cause for

an effect, but the proof is required that this cause is the real one, and Mr. Ducouedic gives us no reason to believe that he has discoverd the true one. It is not however a malady of a dangerous nature, as it seldom shews itself above a fortnight in a hive, and does not appear to affect the labour of the Bee.

The vertigo generally attacks the Bees in the months of May and June: it is very easily perceived, for the Bees run in a retrograde manner, and often turn about so long, until they drop as it were, lifeless on the ground; in this situation they generally become the prey of the birds or other enemies. There is no remedy known for this malady, and the cause of it even is all conjecture; the most plausible which strikes me is, that it arises from the flowers of the class umbellæ.* The hives should therefore be removed from the vicinity of those plants. †

The abortive Brood, although it cannot be classed as an epidemical disorder, is still of very injurious consequences to the Bees. It arises from the two following causes; first, when the Bees have given the larvæ a vicious food:—and secondly, when the worm is placed in its cell, with its tail towards the orifice; in this state the young Bees, incapable of extricating themselves from their prison, die, and putrefy.

* *Umbella.*—The characteristic of the flower of this species is to have the form of an umbrella, such as angelica, carrot, hemlock, parsley, &c.

† See the Researches of Dr. Paulet, on Epizootic Maladies.

‡ The Abbé della Rocca, speaks of an epidemical disease, which from 1777 to 1780 attacked all the hives in the Island of Syros, in the Archipelago, and was very near annihilating all the Bees.—He attributes it entirely to infected combs, or to the brood being placed in the cells in an inverted manner. See Cap. VI. Vol. III. Traité complet sur les Abeilles, par L'Abbé della Rocca.

The cells which contain the brood in a healthy state, are closed at the top with a thin cover of yellowish wax, and is rather convex; if the brood is abortive, the top is concave and rather black. The Bees in general know how to rid themselves of the abortive brood before it putrefies; but should this accident take place during the winter, the infected combs should be cut out when the hives are examined in the spring. The brood is sometimes killed, when after a mild winter, a severe cold suddenly comes on, and deranges the whole atmosphere. A number of embryos are then killed in the hive, and being extricated from the cells by the Bees, they drop on the stand. To save the Bees the trouble of dragging the corrupted bodies out of the hive, the stand should be frequently cleaned.

Some authors assert that the Bees are infected with lice. I am well convinced that these vermin may be found *in old hives*, but I never yet observed any in the new ones.*

The Bee-bread has been considered by some as a malady, but this is an error: it is merely the farina deposited in the cells by the Bees as provision, and for the formation of their combs, and which from the interior heat of the hive, has gained that consistency as to become of no further use. As the Bees waste

* Madame Vicat, in the 'Memoires pour servir a l'Histoire naturelle des Abeilles,' says, "that the lice which stick to Bees are not generally thought to be prejudicial to them, and this may be true, when there are few of those vermin; but when every Bee in a hive has perhaps two or three lice upon it, as is often the case, we may believe that the Bees are greatly incommoded by them; indeed we may be assured of it, by their using every means in their power, though ineffectually, to get rid of them." Mr. Reaumur declares that he cannot think well of a hive, in which the greater number of Bees have lice upon them.

a great deal of time in ridding themselves of it by gnawing it away gradually, it ought to be cast away with the cells containing the abortive brood; but great judgment is necessary in this operation, and unless a person be an adept in the practice, it would be more prudent for him to leave the business to be performed by the Bees.

CHAP. IX.

ON THE BROOD.

HAVING described the origin of the Bees, the natural constitution of the Queen and of the Drones, I now proceed to treat of their brood, and the manner in which it is nourished.

By the brood is understood the three different states of egg, worm, and nymph, and it is on these states that the prosperity, the conservation, and multiplication of the Bees depend for the establishment of new colonies.

The daily loss which the Bees experience in their families, must be a matter of regret to every well-wisher of those valuable insects: although desertion is never known amongst them, still their lives are always in jeopardy, from disease, high winds, the feet of animals which crush them, or which devour them in their flight. Some lose their lives in the wool of animals, to which they attach themselves, or in the webs of the spiders; others die in defence of their habitation and their provisions, by which means, their army, although very numerous, would be soon reduced, were it not continually recruited.

The cells, of which I shall speak hereafter, are for the purpose of containing the honey and the propolis which the Bees collect, and also for the eggs which the Queen Bee lays.

These eggs are broad at one end and pointed at the other. At the end of three days the egg is hatched, and a white worm is produced, which is visible at the bottom of the cell. It remains always in the same position, that is, in the form of a ring. In this state it is known by the appellation of *larvæ*. Although this maggot appears without action, and in a state of stupefaction, it contains within it every principle of life. According to the season, it grows for five or six days; it then weaves around itself a whitish silky film, and then changes into a white chrysalis. In this state it is called a nymph. This transformation, which is one of the most admirable works presented to us by Nature, is common to all flies as well as to the Bee; a circumstantial detail is therefore not necessary. I shall nevertheless enter more largely into the distinction of the two words; nymph and chrysalis, which are often confounded together.

The Bee in its state of nymph is enveloped in a pellicle so delicate and fine, that its six legs may be distinctly seen arranged under its belly, and the proboscis bent in its own length. The Bee in this state is white; in the sequel all the parts of the body become gradually covered, and insensibly develop themselves. In this point we acknowledge the progress of Nature, who in all her operations proceeds by insensible shades. The Bee is generally in its state of perfection from the 21st to the 23d day. The drone

takes its flight usually about the 27th; the queen about the 16th. These developments are slower in the hives, which are but indifferently peopled, or during the temperate season; they are entirely suspended during the cold weather.

The young Bee makes use of its teeth to liberate itself from its prison, and to break the envelop in which it has been wrapped: this is an operation very difficult to the young Bees, and there are some which cannot succeed in effecting it. The Bees shew, however, like all other animals, every imaginable care for their young ones, until a particular time marked out by Nature: this period being passed, their love is changed into indifference, a contrast which renders susceptible the difference between instinct and reason.

The young Bee has no sooner emancipated itself from its cell, than the common Bees flock around it, and with their proboscis cleanse it of any extraneous matter which it may have brought from its cell. At the same time the young Bee seems delighted with the attention which is shewn to it. It first tries its wings, then cleans its antennæ, and in a few minutes is in the fields gathering provision for the hive.

As soon as the young Bee has left the cell, the old Bees immediately proceed to clean it, and prepare it for the reception of a new egg, or for honey. The film which enveloped the young Bee is found attached exactly to the side of the cell, and which is the cause of it appearing a different colour. These films accumulating one upon the other, form that species of button which is found at the bottom of the cells of the old combs

In proportion to the quantity of brood in a hive is the irascibility of the Bees; the least motion, the least novelty, which presents itself before the hive, rouses their anger, and makes them run in crowds to defend it. At this time they should be suffered to remain tranquil, and no experiment should be made upon them. As the brood diminishes this agitation ceases; and when it has taken its flight, the Bees become tractable and quiet.

Many disputes have taken place among naturalists on the particular nature of the food which is administered to the brood, whilst, in the state of larvæ: some have determined it to be pure honey; others, a mixture of honey and farina; and others assert that no food whatever is administered to them. M. Ducouedic is of the latter opinion; and in the postscript to his *Ruche Pyramidale*, he handles all those apiarians very roughly who maintain the contrary opinion. In a case of this kind, where the truth cannot be positively ascertained, analogy is the next surest method; and I will therefore select the common butterfly as an example in point: The female butterfly lays her eggs as also does the Queen Bee; but what is the immediate produce of these eggs? It is not a butterfly, but a caterpillar, which devours the herbs; has strong jaws, a prodigious stomach, a great number of legs, and which weaves round itself a web with considerable art. The egg of a Bee bursts, and a small caterpillar is the result. Its nature and constitution prevent it from finding its own food, as is the case of the caterpillar from the egg of the butterfly; and as no instance can be produced in nature, in which an object, the vital principle of which is set

in motion, can subsist without some nutriment being brought to it, or procured by its own powers; it is therefore a natural conclusion, that, in order to enable the larvæ of the Bees to perform those functions which are inseparably from vitality, and to attain to that growth when Nature has appointed a change in its form, it is necessary that food of some kind should be administered to it. The question then arises, what is the nature of that food? In regard to its being pure honey experience contradicts it, as the following experiments will testify. Being convinced of the existence of brood in one of my hives, I opened it, and extracted a small piece of comb; the cells of which were filled with larvæ. In one cell, in which the larvæ was very young, there was perceptible at the bottom a whitish liquid, which was insipid to the taste. In another, in which the larvæ was further advanced in age, the liquid inclined to the yellow, and had a saccharine taste. In a third, in which the larvæ had attained its full growth, the liquid had a saccharine acidulous taste. In determining the nature of these liquids I acknowledge myself surrounded with difficulties, and beset with incongruities and contradictions. In the first place, this whitish liquid must be collected in the fields, or prepared at home. If the former were the case we ought to find the bladder of the Bee sometimes full of this liquid. This however has never happened. If this mucus were a compound of honey, farina of flowers, and water, how can it be always white, as the farina is almost always yellow, and sometimes of a dark brown? Besides, in what part of the body of the Bee is it formed? Is it in the bladder? It is certain that nothing but water and

honey have ever been found in it. If it be prepared in the bag of the intestines, which is the only stomach of the Bees, it requires, in the first place, that this matter in the intestines of the Bees should be sometimes white, which it never is. Secondly, that from this stomach it might be disgorged into the cells; but the Bee has never been forced to disgorge the smallest drop which is in the bag of the intestines, whatever compression might have been made upon its belly. Thirdly, it is known that farina causes a quantity of fæces; and it would not suit the larvæ to be filled with it, as it never voids any excrement until it leaves the hive.

These are the arguments of those who maintain that honey is the only food which is administered to the larvæ; but these objections are not of sufficient weight to induce me to alter my opinion. The first objection turns on this point, that the Bees extract from the flowers and shrubs the materials with which they compose the food of their embryos, that is, honey, farina, and water; but it is in the hive, and perhaps at the very instant when it is required, that they compound those materials according to their own method, in order to form the requisite food. It is certain that the Bees make a considerable collection of pollen every year, and that in a well constituted and healthy hive, there is always an abundance of it. The Bees, supposing them to be in a state of confinement, can extract it from their magazines to form, with the assistance of honey, the necessary nourishment for their brood. In regard to water, the Bees can procure it from the sides of their hives, where the perspiration, in a state of condensation, is to be seen

I have mentioned these three circumstances in refutation of an argument which has been brought forward by a celebrated apiarian, founded on the circumstance of his having found in a hive, the Bees of which were confined for three months, some brood in a very advanced state; and he therefore concludes, that as the substances, namely, honey, farina, and water, could not at that time be found in the hive, the only nourishment of the brood was honey.

If this food be never found in the bladder of the Bee, the cause is, that the Bees only form it as the occasion demands; further, if this liquid or mucus be of a different colour from farina, it is because the Bees extract only the finest part of it, or the essence: they afterwards mix it with water and honey, which give a greater clearness to it. The proportions and necessary mixtures to form the nourishment of the brood can be easily performed by the proboscis, the tongue, the mouth, and the teeth of the Bees; from which it results that there is no necessity that this whitish liquid should sometimes be found in the entrails of the Bees, nor that they should be made to disgorge it.

Although the farina be the cause of the fæces amongst the Bees, that is no ground from which the conclusion ought to be drawn, that it ought to produce it also in the embryos. If a young chicken be fed with eggs only, a quantity of fæces will be produced; but as long as it is enclosed in the egg no excrement is produced.

CHAP. X.

ON THE COMBS OF THE BEE.

IMMEDIATELY on a swarm taking possession of a hive it begins to clean its new habitation, and to deprive it of all obstacles which might impede the construction of the combs. In a new straw-hive there are always some projecting straws left; the cutting away of which costs the Bees a great deal of trouble. I invariably smoke the interior of my hives, and then rub them with a hard brush until all the projecting straws are removed.

It is universally admitted by all apiarians, that the Bees employ no other substance for the foundation of their combs than propolis. The ancients, however, make mention of two other substances of which the Bees make use before the propolis in the construction of their combs. Pliny informs us, that the first substance with which the Bees cover the place where they begin the construction of their combs is called *commosin:* it is bitter to the taste. On this first layer they spread a second of a weaker consistency, which is called *pissocosos.** It is not until after these two

* Albert believes that this *pissocosos* is nothing more than *pingue oleum instar ceræ pice admixtæ*, that is, a mixture of a species of thick oil, arising from a mixture of wax and pitch.

layers are laid that the Bees make use of propolis, which Pliny designates as being less viscous than the two others, and approaches proportionally to the nature of wax.

In leaving the parent hive the Bees are provided with all the necessaries requisite for the commencement of their labours, and also a sufficiency of food to support them for some days. The most convincing proof of the truth of this position is, that if the proprietor be too tardy in housing his swarm, the Bees will begin to form their combs on the spot where they have alighted.

The activity of the Bees at this period is most surprising, and the order which is observed is not less so. Some of the Bees are employed in removing every obnoxious thing from the hive; others, are observed stopping up every little crevice by which the light can penetrate; others, are busy in the construction of the combs, whilst a certain number hasten into the fields to collect the necessary materials.

The Bees always begin their labours at the top of the hive, and generally in the middle, as their foresight teaches them that their Queen must be immediately provided with cells, in which to deposit her eggs; and that it is only in the middle combs in which eggs are ever laid. The direction of the combs is always perpendicular to the base of the hive. This method at the first view appears to be charged with great inconvenience; for their habitation appears as it were suspended in the air.

The weight of the cells, and the magazines of honey and wax, would excite some fear as to the solidity of the work, but our skilful architects never

fail. They attach their combs with a very viscous glue; they multiply this fastening on all sides, and neglect nothing which can insure the stability of their works. At the same time to diminish the weight of their edifice, they give the least possible thickness to the cells; but as one inconvenience general grows out of another, and as the small thickness of the cell would disable them from resisting the perpetual motion of the Bees, they have the precaution to fortify the entrance of their cells with a border of wax, as being the particular part which would suffer the most, and which would be the most often attacked. This border round the top of the cell has however another use, and in this particular the beautiful symmetry of the edifice of the Bees is most striking. Were the cell not to be furnished with this border, it would not retain the honey; and the Bees in this respect display a perfect knowledge of the law of fluids. By means of this border the cell can be entirely filled with honey, even to taking a convex form, and then the pellicle of wax, with which it is covered for the winter's use, presses closely upon it, and prevents the admission of any humidity.

The Bees erect several cells at a time parallel with each other, and which attached to the roof of the hive fall perpendicularly to the base. There is always a space between the combs sufficiently large to admit the passage of two Bees: these may be called the streets of their city. Some persons have seen horizontal streets, but I never yet could discover any.

Every comb is composed of a double row of cells, which are placed back to back, and have one com-

mon base. The figure of the cell is an exact hexagon. Pappus,* the famous geometrician of antiquity, demonstrated that this figure possesses the double advantage of filling a space without leaving any vacuum, and of enclosing a larger space in the same circumference: and it is most wonderful that the Bees have chosen amongst an infinity of figures the only one which could exactly fulfil the essential conditions to which their nature restricted them. The figure of the base is a pyramid formed of three lozenges perfectly equal; the four angles of these lozenges are again so happily combined, and their opening is in such proportion, that the wax is used with the greatest possible economy, in such a manner, that any other lozenge, composed of any other size, would not yield the same advantage. Samuel Kœnig, who made use of the analysis of infinite units to resolve this problem, which was given to him by M. Reaumur, arrived after all his calculations to the mere result furnished him by the Bees. The choice of the figure is however not surpassed, by the astonishing manner in which they construct all the sides of their hexagons, all the lozenges of their bases, and all the angles of the lozenges.

The thickness of each of the combs is rather indefinite. It may however be stated in the aggregate at one inch; the upper is however generally larger. The depth then of each cell is about half an inch, and their breadth is constantly two lines two-fifths. This

* Pappus lived about the year 340, and Samuel Kœnig about the middle of the last century. The works of the former were printed in 1588, and those of the latter after his death.

is the invariable measure all over the world wherever Bees are known.

Independently of the kind of cells which are the most numerous, others are constructed of rather a larger size, which are appropriated to the reception of the eggs from which the drones are to spring. The Bees, in the construction of the cells, have an eye to these two combinations,—that of the size, and that of the number of the Bees, which are to be generated. Thus the cells of the drones differ in their depth and breadth, but they have in general a regular diameter, which is three lines and a half; from which it appears, that twenty of the drone cells would cover a space of five inches ten lines, whilst twenty cells of the working Bees cover exactly a space of four inches. All this labour is performed with so much skill and firmness, that three or four of these sides, placed on one other, do not exceed the thickness of a sheet of common paper.

A different species of cell is also constructed, destined to be the cradle of the Queens. The architects now abandon their ordinary form of building, and construct the cells of a circular and oblong figure, and which possess much solidity. One of these cells will weigh as much as 100 or 150 of the ordinary cells. There is less economy used in the construction; the wax is used with profusion; the exterior is waved; in fine, they are really royal cells. They are very trifling in number in comparison with the other cells.*

* The Bees, in the swarming season, seldom bring to maturity more than fifteen or twenty royal eggs; nevertheless it is certain that the Queen, in the course of a year, lays a great number, which the common

Fig. 1. Pl. VI. represents a piece of comb composed of common cells, drone cells, and four royal cells, in different stages of their growth. a, represents the cells in an empty state; b, is composed of the cells of the drones; they are represented as full of brood, with this difference, that those which are covered are convex, and less united than those of the common Bees.

The letters C, D, E, F, represent four royal cells, more and less advanced towards perfection. The cell C is still empty. That marked by the letter D is more advanced, and contains a royal embryo. The cell E is almost finished, and ready to be closed, because the caterpillar is on the eve of transforming itself into a nymph, and has then no further occasion for the aid of the common Bees. The cell F is entirely finished and closed. It is then that the wonderful transformation of the capterpillar into a nymph takes place, and from the nymph into a perfect Bee.

A piece of honey-comb is a most beautiful sight, every thing is regulated with so much symmetry, and so well finished, that on the first inspection we are tempted to consider it as the *chef d'œuvre* of the industry of insects.*

Bees however destroy, knowing them to be useless. Contardi relates, that in the third part of the Memoirs of the Apiarian Society, established at Lusace, mention is made of a swarm which had a prodigious number of Queens.

* M. Latreille, in his History of Insects, on the article "Bees" thus expresses himself, "In the vast creation of insects, there is no one whose history presents to us such a prodigious number of wonders as that of the Bee. In regard to industry these insects are the *chef d'œuvre* of the creation, and man himself, so proud of his natural gifts, is in some degree humiliated at the view of the interior of a Bee-hive. How is it possible to refrain from those transports of admiration in contemplating

M. Buffon, astonished at the wonders of the architecture and the geometry of the Bees, and being unwilling to acknowledge an intelligence superior to the human, has attempted to explain the labour of the Bee by the rules of simple mechanism.* "These hexagons," he says, "so much admired and applauded, furnish me with another argument against enthusiasm and admiration. This figure, all geometrical, and all regular, as it may appear, and which it actually is in theory, is in this instance nothing but a mechanical result, and sufficiently imperfect, which is often found in nature, and is observed in the most inanimate productions; such as crystals and other stones. Some salts constantly assume this figure in their formation. Observe the little scales of the skin of the sea-calf, they will be found to be all hexagon, because every scale, growing at the same time, presents an obstacle, and tends to occupy the most space which is possible in a given space. These same hexagons are seen in the second stomach of ruminating animals:† they are also found in seeds and certain

the Bee! This insect, so weak, so small in appearance, working without relaxation in collecting the materials of its habitation, forming them with so much art, and constructing those wonderful edifices, the architecture of which has been the subject of the meditations of the most profound geometricians!"

* Our modern Archimedeses, admiring the dispositions of the form of the cells, have found the solution, by a natural mechanism, of one of the most beautiful and most difficult problems of geometry: viz. To make the greatest number of cells in the least possible space, and the greatest number possible with the least possible matter.

† M. Buffon, in this instance, evidently labours under an error. It is certain that a part of the second stomach of ruminating animals assumes a configuration similar to that of the cells of the Bee; and, indeed, there is a particular part of tripe which is known by the name of honey-comb; but no person, I believe, yet discovered in it the exact hexagon of the Bee.

flowers. Fill a vessel with peas, or rather with any other cylindrical grain, and close it tight; after having poured in as much water as the intervals between the grains will admit, boil the water, and all the cylinders will become columns of six fronts. The reason is evident, which is purely mechanical. Every grain, the figure of which is cylindrical, tends by its expansion to occupy the most possible space in a given space; they therefore necessarily become hexagon by reciprocal compression. Every Bee attempts to occupy in the same manner the greatest possible space in a given space; it is therefore necessary as the body of the Bee is cylindrical, that their cells should be hexagon by the same cause of reciprocal compression."

This definition I acknowledge to be most ingenious; but with all due deference to so great a naturalist as Buffon, it is insufficient. One of the most certain facts in the history of these insects is, that all the labours of their little republic are performed only by the common Bees; and that the drones and the queen, so far from contributing to the public works, have not even received from Nature the organs and instruments necessary for the purpose. But if the regularity of the cells had no other cause than is assigned by M. De Buffon, if it were only produced by a mechanical law, and by the reciprocal compression of the Bees combined with their figure, it is certain that all the cells would have the same form and the same dimensions, as they are all constructed by the working Bee. Those of the drones would be of the same size; those of the queen would be of the same form and size; and we should not behold that

astonishing proportion in the number of the different cells with the number of the different Bees which are to be generated.

The theory of Buffon is most ingenious, although not founded on truth; but what character can be bestowed upon the following theory of Lewenhoek: He examined the eyes of the Bee with a microscope, and *he believed* that he observed the light, mixed with shade, depicting on their retina the cells similar to those of their combs, and which led him to the conjecture, that the Bees in their labour could only execute that which was presented to their vision. I shall not stop to discuss the falsity of this singular definition.

The combs when first constructed are white, but as they grow old they lose by degree their original colour, and from yellow they become through every shade almost black: the steam which pervades the interior of the hive may be considered as the cause. The wax, which was originally white, recovers its colour if exposed to the influence of the dew; but all Bees do not make the wax equally white: this depends less on the insect than on the nature of the farina which it collects.* It is also experienced by

* The quality of the wax and its greater or less degree of whiteness depends on the quality of the plants. In the Archipelago, for instance, the wax which is collected from the thyme is the best and whitest. The diversity of the farina of plants carries with it however not that weight which is attached to it by some naturalists, for the flowers of the thyme are very poor in farina, although rich in honey; and at the time in which thyme blossoms, there are few flowers which produce farina. It is however at this particular period that the best wax is produced, and also in the greatest quantity. *L'Abbe della Rocca.*

the wax-bleachers that some particular wax will not take a perfect white.

As the construction of the comb is particularly connected with the origin and use of wax, I beg leave to refer the reader to Chap. XIII. for a further elucidation of the subject.

CHAP. XI.

ON THE DIFFERENT SUBSTANCES WHICH ARE FOUND IN A HIVE.

ON the establishment of a swarm of Bees in a hive, their first care is to close all the crevices with a gluey matter, which is of a viscous nature, soft at the moment in which it is used, but which hardens afterwards, and to which the name of propolis* has been given. Its colour is brown or blackish, and even sometimes of a reddish brown. That which is found in the hive presents other varieties: it sometimes emits a very agreeable aromatic smell when it is heated; and the ancients affirm that the odour of the propolis may be placed in the rank of the best perfumes.

It is supposed that the Bees gather the propolis from the poplar, birch, fir, yew, and willow. M. De Reaumur was never yet able to discover the Bees employed in this particular harvest; and he has seen

* Propolis, a word compounded of πρό, which signifies *before*, and πολίς, *city*, denoting before the city, because it is with this matter that the Bees stop all the crevices and openings in their hive, which is like a city.

the Bees make use of the propolis in countries in which not one of the above mentioned trees was known. M. De Bomare very justly observes on this point, that the discovery of M. De Reaumur is yet to be made.*

In regard to the nature and the qualities of the propolis, it is a resin soluble in spirit of wine and oil of turpentine. Independently of the use to which it is applied in medicine as a digestive, from some experiments which have been made, it has been discovered that this substance, dissolved in spirit of wine, or in oil of turpentine, is an excellent substitute for the varnish which is used in giving the colour of gold to silver, or to tin made into foil. If, for example, it be incorporated with mastich, or sandarac, it would be excellent in the gilding of leather. It is very suitable to expedite the maturity of abscesses; its vapour inhaled by means of a funnel, during the time that it is thrown on the fire, softens the most inveterate and dangerous cough.

The crude wax, which is called in Italian *pane delle api*, in French *cire brute*, or *matiére de cire*, and in English Bee-Bread, is precisely that coloured dust which attaches to the fingers when the calices of the flowers are touched; or to speak in the apiarian language, it is the farina which the Bees collect from the stamina of the flowers.

* L'Abbé della Rocca mentions that, in the Archipelago, the Bees are constantly observed on the mastich-tree, which furnishes the excellent mastich of Scio, and also on the wild cypress, which is a resinous tree, from which they gather the propolis, and from which the idea must originate, that this matter is produced by different sorts of plants in different parts of the globe, more or less aromatic, according to the greater or less heat of the climate.

The ancients gave different names to this crude wax. Thus Pliny says, cap. VI. Hist. Natur. lib. II. *Præter hæc convehitur erithace, quam aliqui sandaracham, alii cerinthum vocant. Hic erit apum dum operantur cibus, qui sæpe invenitur in favorum inanitatibus sepositus et qui amari saporis. Gignitur autem rore verno, et arborum succo, gummi modo Africi minor, austri flatu nigrior, aquilonibus melior et rubens, plurimus in Græcis nucibus. Menecrates florem esse dicit futuræ messis indicium, sed nemo præter eum.**

Nothing is more common than to see a Bee covered with the dust which it could have obtained only from

* *Anglice.* "Independently of other substances which the Bees convey into their hive, they transport *erithace*, which some persons call sandarac, and others corinthe. This substance serves them for nourishment during their labours; and it is often in reserve in the cells of their combs: it has a bitter taste; it is formed by the dew and the sap of the trees, similarly to the gum, and during the time that the wind prevails from the south east, it is produced in a very small quantity: the south wind gives it a blacker hue, and with the north wind it is of a superior and redder quality. The flower of the almond-tree produces a great quantity. Menecratus believed that it was a flower which prognosticated the approaching fruit harvest, but no person adopted his opinion."

I must now make a remark on the last words which I have quoted of Pliny: In the edition of Hardouin the following words only are extant, "*Menecrates florem esse dicit;*" but in other ancient editions the passage is exactly as I have quoted it. The most ancient version of Pliny runs thus: "Menecratus believed that the period of the flowering of the almond-tree is the proper time for the honey harvest." I am myself convinced that by the word *florem*, Pliny merely understands the farina of the stamina, *the erithace;* it therefore follows absolutely, in order to explain the opinion of Menecratus, to say, that he understood the farina of the stamina to be species of flower which indicated, or which operated on the approaching gathering of fruit; and according to this definition I am inclined to believe that Menecratus had some idea of the fecundation of fruits by the farina of their males. If the text of Pliny be well examined, and attention paid to these words, *sed nemo præter eum*, it will be seen that my opinion is not far removed from that of Pliny.

a flower. Common observation teaches us the particular parts of the flower which have yielded it, and it demonstrates also that this dust is the element of wax.

I do not consider myself guilty of an error when I assert that the little pellets of farina, which are visible on the legs of the Bees, are the elementary parts of wax, and which are transformed into that substance by a particular process in the stomach of the Bees: this however will be further discussed in the chapter on wax.

I consider propolis to be a gummy aromatic substance, similar in its constitution to wax, but differing in its fabrication. Its chief element, like the wax, is the farina of plants, which, undergoing a particular process in the second stomach of the Bees, forms that firm, gluey substance, which is known by the name of propolis. It may be considered in some respects as a species of wax, but stronger in its constitution. This may arise from a plus or minus of water, or from a more protracted process in the stomach of the Bee. It is strongly argued by some naturalists, that the Bee forms but one substance, which is wax. I would however recommend to those persons to examine the constitution of wax, and the substance which the Bees employ in closing any crevice in the hive, or in covering the dead body of any animal which they have killed, but which from its size they have not been able to drag out of the hive, and they will find a most essential difference. The fragility of propolis is not so great as that of wax; the latter is more easily reduced to a paste, and possesses not the fragrance of the propolis.

One of the most convincing proofs that the propolis and wax are not collected by the Bees as separate substances produced by certain plants, and consequently not indebted for their formation to a particular process in the stomach of the Bee, may be gained from the following circumstance: In the month of November, 1811, at the request of a friend, I deprived one of my hives of a little honey, and I took the opportunity of cleaning the stand on which it was placed; having performed that operation, I fastened the hive down again, contracting the entrance to those dimensions, as to admit only one Bee to come out at a time. I now judged my hive safe from its enemies, but in this it appears I was mistaken. In the month of December, on inspecting my apiary I perceived the hive to be in an unusual bustle, and the Bees in great agitation. I was convinced that some accident had occurred in the interior of the hive, and I resolved to examine it. To my great surprise, I found a dead mouse on the stand, and it was almost covered with propolis. I at first resolved to remove this nauseous object, but, on more mature reflection, I was not willing to forego the opportunity of experiencing, by actual observation, one of the most profound acts of foresight and wisdom which can possibly be found in the works of the animal creation. What power is that which taught the Bee the necessity of covering the dead mouse with a plaster? It might have been thought sufficient to kill it, that their property might be saved, and then leave it to waste away by the common process of putrefaction. But were this process to be allowed to take place, the health and safety of the whole hive would

be endangered; to prevent therefore this occurrence, the body of the mouse is, as it were, embalmed in a case of propolis, and the object rots away without emitting any offensive odour.

The question, however, which now presents itself for solution is, of what materials was this covering composed? The Bees were not able to collect any farina in the fields, and they must therefore have composed it from a substance which they possessed in the hive, and this could be no other than the propolis or Bee-bread deposited in the combs. This circumstance plainly evinces that the propolis is fabricated by the Bees, and is not a natural substance collected by them.

This substance has been analysed by M. Vauquelin, in the Annales de Chimie 1802, and 1808, and in the Bulletin de Pharmacie by M. Cadet. By distillation, a very sweet essential oil is obtained. If it is placed on burning coals, it emits an odour similar to that of aloes; it mollifies, and in this state it cannot be broken until it is stretched to the fineness of a thread.

M. Lombard says, "that a perfect ignorance prevails regarding the matter of which propolis is made, or whence the Bees extract it;" this is a most singular confession on the part of M. Lombard. He should have consulted his great and infallible M. Huber, and although the sentiments of that apiarian might not have been correct, M. Lombard might have adopted them with that confidence which he has so lavishly bestowed on the fortifications of M. Huber.

CHAP. XII.

ON POLLEN, OR FARINA.

THE botanists designate by the term pollen, or farina, that fecundating dust, which hangs on the stamina of all simple flowers, and which the Bees collect and transport to their hive in little balls, or pellets attached to the cavities of their hinder legs. The Bee roams from flower to flower in quest of this substance, and never returns to the hive until it has collected an equal quantity on each leg. I have observed that the Bee never changes the species of flower, on which it first alights, that is, it never mixes in the same journey the farina of different flowers; it always finishes its load on the same species on which it began: it is asserted by some persons that the Bee often swallows the farina before it enters the hive, this is however, incorrect, for it is only swallowed by those whose office it is to construct the combs, or feed the young.

The manner in which the Bee is delivered of its load is both curious, and interesting; immediately on its arrival in the hive, it ascends the middle combs, and is there met by a party of labourers, who imme-

diately proceed to unburthen the traveller of his load. This operation is performed with the teeth, and the treasure is deposited in a cell, in which it is pressed close down, with the hinder feet. I cannot comprehend how some naturalists can assert, that the Bee unloads itself, by entering the cell backwards, and scraping off its load with its middle feet. In the first place, from the size of the two pellets, it would be impossible for the Bee to enter with both legs at once into the cell; and I believe it has never yet been maintained among the numerous fancies which have arisen on this subject, that the Bee first enters with one leg, and then with the other; how the Bee then could manage to divest itself of its load, must be reckoned as one of those secrets, the elucidation of which, that insect appears determined to withhold from the curiosity of man.

It is however probable, and not at all inconsistent with reason, that as the Bee placed its load on its legs by its teeth and feet, it could also unload itself by the same means, and I make no doubt that this method is often adopted by the Bee, but common sense flatly contradicts the idea of any retrograde motion of the Bee into a cell for the purpose of unloading itself.

It is singular, that a cell is very seldom found full of pollen; it is in general only half full, and the remainder is filled with honey. In this instance the foresight of the Bee is again conspicuous. Were the pollen exposed to the influence of the humidity of the hive, it would soon turn sour and corrupt, but being covered with honey, it is kept in a proper state of preservation, and fit for use, as occasion requires.

Experiments of an easy nature demonstrate that

the farina of the stamina, contains the principles of wax, but it is not wax itself, as some authors maintain. If a small ball, composed of several small pellets of farina, be put into a silver spoon over hot coals, instead of melting like wax, the pellets preserve their figure, dry, and carbonise. If a slight thread be made of these pellets, by rolling them between the fingers, and presenting it to the flame of a taper, it will burn without running, like a piece of dry and resinous wood. If the pollen be thrown into water, it sinks to the bottom, whereas, on the contrary, wax floats; all these distinctive characteristics prove in an incontestible manner, the elaboration of the farina, which takes place in the body of the Bee.

On this head the Abbé della Rocca, says, "that supposing the Bees to form the wax only from the pollen, it is necessary that it should be digested in the stomach of the Bees; and this he positively denies to be the case, and he founds his opinion on the result of the experiments of Mr. Geer, who, in his Memoir on Insects, says, 'according to the opinion of all chemists, it is impossible to effect the decomposition of wax, in any manner whatsoever, and even if the same means were employed, as in the decomposition of stones and metals, from which it is apparent that the strongest stomach cannot digest it, excepting that of the wax moth.' But if the stomach of the Bee possesses the strength to transform the pollen into wax, I do not see why another stomach, equally hot, or some particular chemical process, could not produce the same result."

M. De Reaumur made several experiments for the purpose of trying, if it were not possible to extract by art the genuine wax from the pollen, and he proposed

to himself to enter into a kind of partnership with the Bees in the manufacture of wax; but all his experiments have only tended to convince him, that it is not more easy to make the genuine wax from the farina of plants, than it is to make chyle with the different substances which serve us for food, or to make silk, by distilling the leaves of the mulberry-tree.

I have had occasion to mention Mr. Ducouedic, as a French apiarian of no mean celebrity; he has successfully refuted the system of Huber, and his adherents in regard to the propagation of the Bee, and therefore I am sorry to differ from him in some very essential points, and in no one more so, than in his opinion of the nature of pollen. The naturalist, as well as the apiarian will be gratified to investigate his sentiments on the subject, and I will therefore translate them as they appear, page 117 of his *Ruche Pyramidale*, second edition. I request particular attention to those passages printed in italics.

"We see in fine weather the Bees, loaded with pollen, convey it in a state of nature into the hive. It is on the part of the Bees *a superfluity of booty*, and is prepared by the Bees of the interior of the hive, for their nourishment. This pollen, which is consumed by them, *becomes honey, wax, or propolis, according as the demand for the different materials require it. The pollen is therefore what may be properly called a portion of the nourishment of the Bees, and is one of the principles of honey, wax, and propolis.* It is a saccharine substance, transported in its crude state into the hive, by a certain number of working Bees of the most avaricious disposition, who, not being satisfied with having filled their first stomach, ('with what?')

also load the triangular cavities, which they have on their hinder legs. The much talked of *crude wax* does not exist in nature, *and the pollen is, in reality, nothing more than a balsamic substance which is converted into honey.* I even believe that this substance before changing its nature, may *be a sort of a feast for the Bees of the interior, who subsist in general only on honey, or it may be a balsamic remedy, necessary for the preservation of the health of the Bee in the interior of the hive,* and finally it is only in these relations that pollen ought to be considered."

I do not know in what relation to consider the author of this theory. The mere desire of asserting a novelty certainly cannot have led him into the commission of so gross an absurdity, and it must therefore have arisen from downright inconceivable ignorance. The veriest tyro in natural history knows that the farina or pollen of flowers, and the saccharine substance which is contained at the bottom of its pestules or nectarium, are two distinct and separate matters. No art, no elaboration in the stomach of the Bee, could possibly convert the farina into honey; there is no analogy in the substances, and when it is distinctly proved that honey exists in nature as a separate substance, and is to be found by the Bee by projecting its proboscis to the bottom of the pestule of a flower, I cannot but conceive that the most direct ignorance could alone have urged any person to promulgate such a wild and improbable story, as that farina or pollen is the fundamental principle of honey. Were pollen analyzed into one hundred parts, I do not believe that it would contain five of saccharine matter. Its constitution is diametrically opposite, nor can

any analogy be found by the profoundest skill of the chemist, or the elaborate intestinal powers of the Bee.

Considering that M. Ducouedic must have had before him the ingenious examination of M. de Reaumur, on this subject, my surprise is the greater that he should have fallen into so palpable an error. It is most certain that the Bees consume a considerable quantity of this pollen, the greater part of which is converted into excrement, and a very small portion of it, being digested in the stomach of the Bees is transformed into perfect wax, that is, into a paste which is emitted from their mouth in white froth, and with which they construct their combs of wax.

M. de Reaumur calculates that, in a hive of 18,000 Bees, every one may make four or five journies a day, and that eight pellets of farina are required to form a grain in weight. The Bees during six or seven succeeding months collect 100 pounds and more of this matter, and yet, if at the end of a year the wax be extracted from a hive, only about two pounds of real wax will be found; from which the natural conclusion may be drawn, that the pollen forms a part of the nourishment of the Bee, and that very little real wax is extracted from it. Another very important use to which the Bees apply the pollen, is in the nourishment of the young brood, and on this account it is called in Holland, Flanders, Brabant, Italy, and the Archipelago, *Bee-bread*. I am entirely of the persuasion that a mixture of the pollen with the honey is very necessary to preserve the Bees in good health. This is confirmed by the following fact; if Bees are obligated to live entirely upon honey, after having exhausted

their stock of pollen, they are in general attacked with the dysentery, and the best method which has been adopted of curing them, is to place some combs in their hive, the cells of which are filled with pollen.

M. Huber's experiments on the appropriation of pollen in the nourishment of the young brood, are in my opinion decisive. He had a stock of Bees in a glass hive with twelve partitions, the Queen of which was barren. The cells were destitute of pollen, and possessed some honey. On the 16th July, he removed the Queen, as well as all the partitions, excepting the first and twelfth combs, the cells of which were occupied by eggs, and larvæ of all ages; the cells in which pollen was perceived were cut out, and the hive was closed with a grate. On the 17th the Bees appeared to tend their young; on the 18th, after sun-set, a great noise was heard in the hive, the shutters were opened, and it was remarked that the whole community was in a tumult, the brood combs were abandoned, the Bees gnawed the grating of their enclosure, and they were set at liberty. They flew out in great numbers, but the time not being proper for field work, and the darkness and coolness of night coming on, they were obliged to return to their combs. Order appeared to be re-established, and the hive was closed as formerly. On the 19th the sketch of two equal cells was distinctly seen. On the evening of the same day, and at the same hour as on the preceding night, the tumult recommenced, the Bees were again let loose, and having returned, the hive was again closed. On the 20th, the fifth day of their captivity, the brood was examined, with a view to discover the cause of the periodical agitation of the

Bees. The hive was carried into a chamber, the windows of which were closed; the Bees were set at liberty, and it was discovered that the royal cells had not been continued;—not a single egg, nor larvæ,—not an atom of matter necessary to the aliment of the larvæ, was to be found,—all had disappeared;—the larvæ had perished from hunger. Can this be supposed to arise from any other cause than the absence of the pollen? As to this point, it was therefore only required, to carry conviction, to restore to them some pollen, and then to observe the results. For this purpose the Bees were restored to their prison, after having substituted new combs, containing eggs and young larvæ in the place of those which had perished. On the 22nd, the observation was made that the Bees had fastened their combs, and that they had fixed themselves on the new brood: some fragments of combs were then given to them, in which other Bees had stored some pollen, and they were placed openly on the stand of the hive. In the course of a few minutes, the Bees partook of the pollen, devoured it greedily, attached themselves to the cells of the young larvæ, into which they entered head foremost, and remained in them for a greater, or less time. The hive was gently raised, and the Bees which devoured the pollen were powdered, and it was remarked that the powdered Bees returned to the pollen, then again repairing to the brood, and entering into the cells of the larvæ. On the 23rd, the royal cells were begun. On the 24th, it was observed that all the larvæ had some mucous matter upon them, that some of the cells had been very lately closed, and that the royal cells had been elongated. On the 26th, two royal cells

had been closed during the night. On the 27th, full liberty was granted to the Bees; the mucous matter was still found in the cells which contained the larvæ, and a greater number had been closed with a covering of wax, and on opening several of them, the larvæ were found employed spinning their cocoon.

After this experiment no further doubt can be entertained that the pollen was the aliment of the young Bees, and that it was the deficiency of this substance which caused their death, and the evident agitation in which the old Bees remained during their former captivity.

One argument of those persons who maintain that pollen is not the constituent principle of wax, is, that other flies, except the Bee, collect the farina of plants, that they carry it to their nest on their hinder legs like the Bee, but that they do not make any wax,—ergo, the farina on the legs of the Bee can have no affinity to wax.

The force of this argument however does not strike me; besides it is not consistent with truth, nor experience. The cells in which the honey of the Humble Bee is deposited are a species of wax, and have all the properties of the wax of the common Bee. The Humble Bee is observed to collect the farina on its legs, and to convey it to its nest for the nourishment of its young, and the formation of its cells. It is, besides, an assumed conclusion, that because no other fly nor Bee makes wax with the pollen, that the common Bee cannot effect it. Nature may and has endowed the Bee with those distinct and peculiar properties, by which the substance called pollen, is converted into wax, as being necessary for its support, and propaga-

tion. No analogy can however be traced, say the opponents to this system, between the pollen and the wax,—but in answer, I ask what analogy can be found between the thread of a spider's web, which is evidently produced by an elaboration of its aliment, and the fly which it entraps for that aliment? What analogy is there between the thread of the silk worm, and the mulberry-leaf on which it has fed? These things may appear impossible, or improbable to the limited capacity of man, but these phenomena are daily presented to his eyes, and if he cannot immediately discover a clue to their elucidation, he should bow with humility to that power, who, by concealing some of the operations of nature from us, teaches us to admire his unbounded power and wisdom.

CHAP. XIII.

ON WAX.

In the description of this substance it is scarcely possible to avoid a repetition of what has been already said in the preceding chapter on propolis and pollen. There exists so strong an analogy between the former and wax, that some authors consider them as one and the same substance: they possess the same unctuosity and inflammability; and when melted together, no visible difference takes place in the nature of the wax.

Previously to entering into an analysis of its natural constitution, it may not be irrelevant to take a cursory glance of its importance as an article of commerce, and to suggest some means by which the growth of it may be increased in this country.

If it be true that a country is impoverished in proportion as it pays for the commodities of another, this country is annually impoverished in the sum of nearly 80,000l. by the mere purchase of the article of wax. The chief market for this article is in the north of Germany; at the ports of which, and particularly at

Dantzic, is concentered the whole annual collection of the interior of Germany, and those countries immediately bordering on it. A considerable quantity of it is thence shipped to England, and the question here arises how far it is prudent or politic in England, to pay annually an immense sum for a commodity, which could be obtained in superfluity from her own domain, and which is suffered to perish for want of encouragement and attention.

In our fields, our plains, our heaths and woods, we every-where see a number of those flowers from which an abundance of wax and honey might be extracted, far exceeding the wants of the kingdom; but this advantage appears to be most lamentably neglected, because the culture of the Bee, which is a species of rural economy the most interesting and profitable, is discarded, and we disdain to pay attention to the cultivation of that industrious insect, which proves a source of affluence and prosperity to neighbouring nations. The remedy is in our own hands; but until the system of the management of the Bee is entirely changed, no rational hope of ultimate success can be entertained.

The barbarous custom of suffocating the Bees to obtain possession of their treasures impedes the multiplication. How is it possible that Bees should not be scarce, when, on the one hand, very few are reared, and on the other, the whole produce of the year is generally destroyed! The true cause of the scarcity of wax in the kingdom is thus not difficult to be discovered.

In regard to the various qualities of wax there is sometimes a great difference between the wax made

by different Bees in different countries and climates. This difference consists principally in one being more difficult to bleach than the other. A clear white can be given to the wax of one country, and in the same country, the wax which is obtained from some hives cannot possibly be made to assume that whiteness, which is obtained from the wax of other hives.*

The circumstance which is the most detrimental to the wax, is the moisture incidental to old hives, because, when the rain beats violently against the hive, it penetrates with facility, and the humidity which is imbibed by the straw, pierces in a short time to the interior of the hive. It spoils and corrupts all the labour of the Bees, inspires them with disgust for their habitation, and obliges them at last to abandon it. This accident is too common in old hives, and, whatever precautions may be taken, it is almost impossible to prevent it. Its remedy is still more difficult:—Sometimes the entire combs of the hives must be cut away, within four inches of the top, and this operation is attended with peculiar difficulty: it also disconcerts and afflicts the Bees so much, that if they do not forsake their domicile, it takes them a whole season to repair the loss.

It is rather a singular circumstance in the history of the Bee, that in all its operations, there are few

* On this head the Abbé della Rocca says, that the quality of the wax, and its greater or less degree of whiteness depend on the quality of the plants. In the islands of the Archipelago, the wax which is collected from the thyme is the best and the whitest. The diversity in the farina of the stamina is of no account, because the flowers of the thyme bear not any farina, and at the period when it blooms there are no other flowers which produce it; it is nevertheless at this particular period that the Bees produce the best wax and in the greatest abundance.

persons who are of one accord. If we consult Aristotle, and from him all authors in gradual succession, who have written on the Bee, we shall find the most contradictory sentiments prevailing respecting the origin and formation of those substances which compose the interior of a hive. The origin of wax has been the shuttlecock of contention, and has been bandied about from the earliest period to the present time, and is still kept up; for although experiment has been heaped upon experiment, and each individual pronounces the infallibility of his theory, yet another theorist immediately starts up, and demonstrates its fallibility.

The experiments of M. Huber on the origin of wax might be considered by some persons to be conclusive, and the plausibility of them has no doubt gained many adherents to his system. I will examine these experiments, and, I trust, I shall be able to prove that pollen contains in itself the principle of wax, which is produced by an elaboration in the second stomach of the Bee.

The first experiment which M. Huber performed consisted in lodging a swarm in a hive, to which he gave honey and *water* for their consumption. The Bees were confined, giving them a sufficiency of air. After five days of captivity, they were permitted to take their flight in a close chamber; and on inspecting the hive it was found to contain five combs of a perfect white wax suspended to the top. This experiment was repeated five times, with the same Bees, and the same precautions; the honey was each time devoured, and new combs constructed.

In answer to this experiment, I consider it by no

means decisive of the question; and for the following reasons:—It is well known to those persons who have paid due attention to a swarm on its being hived, that many Bees are to be perceived amongst them who have the pellets of farina on their legs; and there is no doubt, from an experiment which I myself tried, that a considerable number have the undigested pollen in their stomachs. M. Huber had furnished them with every necessary requisite for the construction of combs, and *one which was indispensable, viz. water.* There is no doubt that when a swarm leaves its parent hive, the Bees are fully provided with the requisites for the construction of combs, and all the extraneous aid which is required, is that of water: and until that be obtained not a single cell will, nor can be made. I once hived a swarm, and in half an hour afterwards the sky became overcast, and a rain set in, which continued two days; at the end of that time not a single cell was constructed in the hive; on the third day, the weather being clear, the Bees were observed to take their flight to their favourite rivulet, and the construction of the combs immediately commenced. They possessed within them that substance which was necessary for the constitution of the combs, and they only required a certain degree of moisture to render it malleable and ductile.

The second experiment of M. Huber was,—He confined the Bees in the same manner, and gave them only pollen and fruits for their food during their captivity. This lasted eight days, and not a single cell was formed during that time. This experiment was tried upon sixty-five hives, and the result was always the same. The conclusion is therefore drawn that

pollen does not contain the principles of wax. Had this experiment been tried upon one hundred and sixty-five instead of sixty-five hives, I do not doubt that the result would have been always the same; and my surprize would have been great had a single cell been constructed. It must be particularly observed, that to these Bees M. Huber gave *no water*, and therefore he deprived them of the very means with which he had supplied the others of forming their combs.

The third experiment of M. Huber is as follows; and it is on this that he founds his demonstration, that wax results from honey, and not from pollen. M. Huber was desirous to know if it was the saccharine part of the honey which enabled the Bees to produce wax; and, for this purpose, he confined the swarms in glass-hives, one with a pound of lump sugar reduced to a sirup, and another with a pound of very coarse moist sugar reduced also to a sirup. The Bees of both these hives produced wax, but it was not in that quantity which was produced from the honey and water as in the first experiment. The production of wax however from mere saccharine matter convinced M. Huber that wax was indebted to its origin to honey, and not to pollen. This experiment was repeated seven times successively, and always employing the same Bees as prisoners.

I do not think that the result of this experiment tends by any means to establish the position, that wax is formed from honey. The former objection which I stated, rested upon this ground, that water was necessary to the Bee to enable it to construct its cells. Now M. Huber does not inform us with what liquid

he reduced his sugar to a sirup, whether with water, or ale, the two most common dissolvents in this case; but take whichever he pleases, M. Huber will gain nothing by the bargain: the mere addition of a saccharine matter, which at a certain temperature becomes itself a liquid, and, although glutinous, is modified by the incorporation of common water or ale, does not, by any means, deprive those two liquids of any virtues which they may possess individually, and unincorporated with any extraneous matter. We will state the case: supposing a Bee leaves the hive in search of water for any particular purpose connected with the welfare of its society, and, by way of experiment, two vessels are placed, one filled with water, and the other with water sweetened with sugar; *it is a liquid only which is required for the purpose*, and it will then certainly choose that which is most gratifying to its taste. The sirup which M. Huber gave his Bees was literally nothing more nor less than sweet water; and it was therefore most probable that the Bee preferred the sweetened water to that which was unadulterated: but it does not follow that the sweetened water would not answer all the purposes of the genuine water, and therefore that it is as proper to be employed by the Bees in rendering their pollen malleable as the pure water of the rivulet. I am even inclined to believe that honey itself may be used by the Bees in rendering the pollen malleable for the purpose of constructing their combs; but I do not mean thereby to infer that wax can be produced from honey without any other concomitant, but that in the absence of water, or other liquid, the Bees may have recourse to honey as a substitute, and this may

have led M. Huber into the error of supposing that wax is produced by honey, and honey only.

M. Huber's experiments appeared conclusive to the majority of foreign apiarians; and some even, wishing to extend their researches to a still greater extent, pretended to have analyzed wax, and to have found its affinities perfectly analogous to honey. These discoveries can however only excite a smile on the countenance of the chemist and the naturalist; but the adherents of M. Huber were still more rivetted to their opinion by a Memoir on Bees, which was addressed in May, 1812, to the Society of Agriculture, of Paris, by Mr. Blondelu, an apiarian at Noyou, and from which I translate the following extract.

"About two years ago, in the course of the month of October, when the flowers had died away in the meadows and the woods, and the hives were on the eve of being securely protected for the winter, the Bees having finished their harvest of honey, I emptied the Bees of a common hive into one of my boxes which was quite empty. I placed under it a sort of trough filled with honey; the Bees immediately descended, and never desisted until they had imbibed the whole. This honey was of the common sort of Brittany, thick, and of a brown colour; but my surprise was great, *that, with this material alone, they constructed combs as white as snow*, and which they filled with honey of a brownish colour, but much more clear and pure, and of a more saccharine nature than that which I had given them. I repeated this experiment during the last summer with several of my boxes, and *always with the same result, and the*

same success. Many persons were witness of the fact. According to this experiment it appears to me that the Bees constructed their combs only with the honey which I had given them, as the box was quite empty, and that as they never left the hive, owing to the season not yielding to them any resources, the conclusion may be drawn that the wax is the produce of honey elaborated in the stomach of the Bees, and not that of the farina of flowers, which they carry on their legs, and which is known by the name of pollen."

This memoir was no sooner published than it was bruited abroad as a triumphal confirmation of the discovery of M. Huber; but I do not see that Mr. Blondelu has, by any means, confirmed the theory of honey being the origin of wax. He places a hive of Bees in an empty box, with some honey, as their food, not examining, nor informing us, whether the Bees had in their stomach, at the time of their removal, the necessary ingredient for the formation of wax. The substances contained in the two stomachs of the Bees are so very different that no person can mistake them; the one is a transparent fluid, the other a muddy yellowish substance, which is the pollen in a state of elaboration, and from which the Bee can form its wax as occasion requires. We are not informed in this experiment whether the Bees were totally deficient of the substance in their second stomach; and if they were not, (and I will venture to affirm that they were well provided with it) they possessed in themselves the full capability of making wax without the aid of any exterior substance. M. Blondelu further declares, that he found the honey which he gave his Bees deposited in the cells, of the same brown colour,

though much clearer. The test of this experiment would have been to have weighed the honey given with that deposited in the combs, and I am convinced, even after making due allowance for the quantity which the Bees may have appropriated to themselves as food, that the weight of the combs would have been greater than that of the whole of the honey. The inference therefore must be drawn, that if honey be one of the constituent parts of wax, it must be considered only as an auxiliary, and not as the principal.

There is one particular circumstance which, in the report of these experiments, appears to have escaped the observation of these naturalists. It cannot be questioned that every liquid will deposit a sediment if suffered to be at rest, or which can be effected by the incorporation of a denser body, which weighs down the floating particles to the bottom. But, wonderful as are the operations of Nature, and indistinctly as we may be acquainted with them, we have yet no positive experience of a solid body being obtained from a liquid only, whose constituent parts bear no homogeniousness. The elements of the thread of the silkworm, the web of the spider, and the film of the caterpillar, are vegetable and animal substances. The pollen which serves for the aliment of the young Bee, and which enables it in the state of larva to spin its silken web, is as much a vegetable substance as the mulberry-leaf on which the larvæ of the silkworm feed, or the cabbage-leaf which is devoured by the caterpillar.

In the Memoirs of M. Bonnet on Bees, another opinion on the origin of wax is hazarded, and which has been adopted by Mr. Duchet. It is there assert-

ed, that the wax is nothing more than the honey congealed in the stomach of the Bees, which, becoming wax, exudes through the scales of their body. The origin of this singular opinion is to be found in the circumstance of particles of wax being sometimes found between the scales of their body.

Swammerdam says, "that the Bees are sometimes seen carrying real wax into the hive. They pillage it from other hives, cut it into little pieces with their teeth, and attach it to the cavities which they have on their hinder legs."

This case is possible, but it has never fallen under my observation.*

In the Encyclopedie Methodique, under the word "*Bee*," are found the following observations on the origin of wax.

"If reliance can be placed on the most exact observations, the wax is contained in the stamina of the flowers. M. Bernard de Jussieu, a man of science, and who would not suffer himself to be easily im-

* M. Chambon in his scientific notes at the close of the manual of Madame A. Chambon, possitively denies this circumstance, and Reaumur himself acknowledges that he never observed it. Speaking of this observation of Swammerdam, M. Ducouedic says, "I never saw the Bees pillage the wax from another hive; the following however, may be considered as a fact in regard to a broken piece of comb, which took place in my apiary during the winter of 1806; a piece of comb without honey, detached itself from the remainder, and it was minced by the Bees, and reduced to pieces as little, and as fine as the smallest sand. This minced wax disappeared insensibly from the stool, without it being perceived that it was taken up into the hive, and I remained convinced that the Bees had made a fresh use of all those little pieces of broken wax, and had employed it for the continuation of their cells, which they constructed during the whole winter from the top to the bottom of their hive. These events are not rare, but proper attention is not paid to them, because among the amateurs of Bees, there are few possessed of discrimination, or observation."

posed upon, asserts this fact after the most particular experiments. The grains of the farina of the stamina, which he put into water, swelled until they burst. At the time when one of these grains burst, there resulted from it a little globule of an oily and unctuous liquor, which floated on the water without ever incorporating itself with it. I have repeated this experiment a number of times, and with the same success, but I do not believe that it is sufficient to prove that the matter, which is destined by nature for the production of the species, is that which serves for the formation of wax, although it contains the principles. I procured for Mr. Fourcroy, a great quantity of the farina from the stamina of hemp, but he was never able to extract any wax from it."

Now, according to the experiments of M. de Jussieu, it may be said that this oily matter which is found in some grains of certain farina, when it is ripe, and has acquired its full perfection, exudes by the pores of those grains, and that the Bees collect and load themselves with it to convey it to their hive. It may also be believed, that several species of plants, especially the aromatic, are gifted with this unctuous matter, which exudes equally by the pores of their bark, the stamina of their flowers, and even by the pores of their leaves, and that this matter is the genuine wax which the Bees collect. *

The question has been long agitated among naturalists in regard to other animals, and plants which produce wax. By some it has been totally denied that there is any other insect than the Bee, to whom

* I am convinced, says the Abbé della Rocca, "that the Bees which we see on the branches, and the leaves of the fig tree are employed only in amassing the exudations of wax, which are visibly perceived flowing on

the formation of wax is natural; although I cannot coincide in this opinion, as it is flatly contradicted by experience, yet it is equally certain that it is not formed by any other insect in such quantity as to make it worthy of being collecting. In regard to the plants, there is a species known in America, under the name of *Myrica*, but which is not the species which is called royal pimento. It is an aquatic shrub, some of which bear the fruit, and others the fecundating flowers. There are two very curious species of them; one grows in Louisiana, where it is called the wax-tree; and the other, rather smaller, grows in Carolina, and is known by the same name.

The wax-tree grows to the height of a small cherry tree; it has the appearance of the myrtle, and its leaves are almost of the same odour.

These trees have been thus called, because their berries which are the size of a coriander-seed, and of an ash colour, contain kernels which are covered with a species of wax or rather of rosin, which has some affinity to wax.

The natives extract from these berries on boiling

these trees, and even on the figs, round the openings of which are seen small globules of an unctuous matter, and from which even the honey is seen to flow.*

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* The father Hardouin relates a certain circumstance in his notes on Pliny, which tends in some degree to confirm this observation of the Abbé, Exolea ceram apes carpere Varro docet, Lib. 3, de re rustica, Cap. XVI. page 114. Non ex flore quidem, ut Plinius rectè observat Lib. 21, sect. 41, sed ex frondium partibus, quæ cum crassiores sint quam florium, cereæ fingendæ videntur esse accommodatiores. Id a se visum observatumque sæpius scribit Albertus, Lib. 8, de animal tract IV. Cap. III. p. 268.

them in water, a species of green wax, which floats, and of which tapers are made. One pound of seeds produces two ounces of wax; a man can collect easily fifteen pounds in a day. They have succeeded for some time past in obtaining this wax sufficiently white, or at least of a yellowish hue. For this purpose, they put the berries in a caldron, and pour boiling water upon them, which is received in troughs or buckets, after letting the wax melt for a few minutes. When the water is cold, a resinous wax appears at the top, of a yellowish hue, but the rosin which floats afterwards in repeating the operation, is of a greener colour. This resinous wax is dry, and has a sweet, aromatic, and agreeable smell. Mixed with a little wax, or soap, it assumes a more solid body, and a greater whiteness on the field, but always less than the true wax.

The water which has been used in the melting of this wax, is astringent. It is said, that in melting soap in this water, it takes as great a consistency as wax. Many persons of Louisiana have been informed by the slaves of Carolina, that no other taper is burnt there than that which is made of the wax, of which I have just now treated. A tree well loaded with fruit can produce four ounces of wax, from six pounds of berries, and one of fruit.

When the wax is extracted from under the fruits, a layer of matter is perceptible on their surface, which is of the colour of lake; hot water does not dissolve it, but spirit of wine extracts a tincture.

There is also a species of wax-tree in China, which is very scarce: it is called pe-la-chu. Some small caterpillars attach themselves to the leaves of this tree,

and form on them some combs of wax, but much smaller than those of the Bees. This wax is hard, of a great polish and scaly, and costs much more than the common wax.

According to a letter from P. Yncarville, written from China, to M. Geoffroy, white wax is obtained even from the caterpillars themselves. In a province of this Empire, he says, "some little caterpillars are found which feed on a tree; they are collected, boiled in water, and yield a species of wax, which being congealed, is the white wax of China.

In regard to the bleaching of wax in this country, it is a process too well known to require in this place any comment. The plan recommended by Butler, in his Feminine Monarchy, is considered the best, and it is the same which is mentioned by *Dioscorides*, in his second book, chap. 105.

The Venetians may be said to have invented the art of colouring wax, and they were for a long time in the habit of sending fruits made of wax, to ornament the seraglios of the Turks.

CHAP. XIV.

ON HONEY.

HONEY is a gummy, saccharine, fermentive substance, and the immediate principle of all vegetables *without exception.** This elementary substance appears destined to the nourishment *of all plants*, and particularly in their infancy, in the same manner as milk is destined to nourish the young viviparous animals. It is found in all flowers, but principally in the single ones: its presence is afterwards perceived in all fruits; it shews itself in the humblest flower of our meadows, in the ears of corn of our fields, and in the leaves of the trees. It exists in the roots as well as in the body, and even in the bark of all vegetables; it exudes from the trunks of trees; finally, it appears to be the soul and vital principle of all plants. On losing

* In the kingdom of Imerethi, which constitutes a part of Georgia, and lies at the east end of the Black Sea, at present subject to Russia, there is found a kind of wild honey, which is called by the inhabitants *stone honey*, because it is quite solid, brittle, and not viscous. It has a pleasant and aromatic flavour, and is found in the clefts of the rocks. Honey and wax form one mass, and are as hard as sugar-candy. The cakes are commonly white, but turn yellow with age, and will keep for a long time. The Imerethians carry it with them in their pocket.

this substance, the plants in general decay, and *it is the period of their existence.* The aliments of the human body are impregnated with this fluid, and the Bees know how to obtain it from almost every substance. It is still however but a gummy saccharine substance, which must pass into the stomach of the Bee before it is converted into honey. As the productions of nature are infinitely varied, the honey, its consistency, its taste and colour, vary according to the productions of each country; the same species of flowers yields a different kind of honey, according to the districts and the greater or less humidity of the season. Even honey of a different quality is extracted from the same hive; that in the cells, in which there has been no brood, is less acrid; the honey of the swarm is superior to that which has been exposed for one year to the vapours of the hive, and the honey of the spring is better than that of the autumn.

The honey extracted from the flowers is the nectar which they enclose, and which was so much boasted of by the ancients, who formed from it the celestial beverage of their gods, to which they gave the name of Ambrosia. This honey is particularly due to the motion and circulation of the sap at the return of spring.

In order to become acquainted with the origin of honey, it is sufficient to develop that of a sweet, or saccharine vegetable salt, which is the element of it, and which appears under a fluid or viscous form, or in little globules. It is the object of the research of the Bees, and it is the substance with which they nourish themselves and their families, or which they

place in their reservoirs or cells, where time and heat preserve it in its proper consistence.

Like other productions of the Bees, naturalists have differed as to the origin of honey. Some modern authors, led away by a vulgar opinion, have thought that honey is a moisture in the air, or a dew which falls upon the flowers and leaves of trees, and on no other objects. It is not a difficult matter to convince these persons of their error, who ought in the first place to consider, that the dew and rain are very injurious to honey, as they dilute it, and prevent the Bees from finding it. It must be open to the most limited observation, that the Bees, so far from fixing themselves on the flowers during the heavy dews, are obliged to wait until the sun has imbibed them, and if some Bees are observed during that time to visit the flowers, it is merely for the purpose of adapting the dew to the same use, as water. It is on a close and sultry day, without dew, that our valuable insects find their richest harvest of this valuable nectar. If the dew were the principle of it, the Bees would find it indiscriminately on all the leaves of vegetables, and in all flowers: this however is not confirmed by experience; and besides, how many flowers are there which are in themselves fertile in honey, and having an horizontal or perpendicular inclination to the earth, consequently do not allow the dew to be received into their orifices.

It is therefore most consistent with reason and experience to suppose, that the honey-dew is an exudation of the vegetables themselves, or a sensible transpiration of that sweet and mellifluous juice, which,

after having circulated with the sap in different parts of certain vegetables, separates itself, and bursts quite prepared, either at the bottom of the flowers, or at the upper part of the leaves, and in some plants displays itself in great abundance.

The primary destination of this mellifluous liquid, or honey-dew, appears to be the nourishment of the fruit in its infancy, but an objection here presents itself, why are the male flowers, which never produce fruit, also provided with honey? Linnæus himself was aware of this objection, and could not solve it to his satisfaction. The utility which the honey is of to the flowers, and the reason why it has been accorded to them by the supreme Being, are but very imperfectly known to us. No botanist has as yet given a direct and convincing elucidation of it, nor has demonstrated either its destination or utility in the vegetable economy of flowers. On this account the solution of this question appears to be wholly abandoned to the researches of our successors. With some degree of truth however it may be advanced, that this viscous liquid is necessary for the continual moisture of the germe during the time of fecundation. It is well known that the process of fecundation is only carried on by humidity. I do not however therefore suppose that in advancing that reason, all the motives of the Creator for forming this mellifluous liquid, have been exhausted, as it is evident that this liquor exists in the male flowers, which never produce any fruit:*

* According to the principle of Linnæus, that generation is only carried on by humidity, the difficulty which here presents itself has no force

but if a secondary reason be required, it is very palpable. This is effected by the motion of the wings of the Bees and other trochilæ, who, in passing over the flowers, detach and disperse the farina of the stamina, by which it can penetrate easily into the stygmates.

From the supposition that the honey transpires from the plants and trees by the action and admixture of heat and humidity, our surprise need not be great to find it at the bottom of the nectarium, or the chalice of the flower, which is the proximate part to the bark or peel, and it may therefore be easily conceived, why in certain days it is very abundant, in others very scarce,—because it follows the motion more or less strong of the sap. Also, why certain vegetables supply a greater quantity than others,—because they are more favoured with a soft humidity, and more abundant in sap. Why the honey possesses qualities so various in different climates,—from the diversity of the vegetables. Why the cold rains, the north wind, frost and snow, are unfavourable to honey,—because they impede the circulation of the sap. Why this mellifluous liquid can abound without dew,—provided the sap circulates freely. Why, with an ardent sun, the harvest of it can be great,—when the vegetables are full of humid juices. And why, finally, during excessive heat honey is scarce,—because the trees and

against the destination of honey, in regard to flowers; for although the male flowers never produce any fruit, they however produce the farina of the stamina, which are the germes that fecundate the female flowers. The honey is therefore necessary to the male flowers for the constant moistening of the farina, and, in fact, on tasting this farina collected by the Bees in their cells a sort of sweetness is perceptible.

plants cannot extract the proper juices from the aridity of the soil.

It is evident that there are two species of honey, one which is contained in the chalice of the flower, and the other which is an exudation on the leaves of trees. The oak and the laurel are particularly abundant in the latter, and on the first view it appears paradoxical, that the juice of a plant, which is of a very deleterious kind, should produce an exudation of a saccharine and wholesome nature. This circumstance has been one great ground on which certain persons found their argument, that the saccharine matter observed on the laurel cannot possibly be an exudation from the plant, but must have fallen upon it in the shape of dew. The homogeneity of this liquid is another argument against its being an exudation, unless it can be proved that the sap of all plants is homogeneous, and this, I believe, the most hardy disputant will not maintain. It is also certain that the most creditable writers on this subject, men of science and knowledge, have maintained that they have actually witnessed the fall of this honey-dew; and M. Ducarne, one of the most intelligent of those writers, thus expresses himself on the subject: "You know," he says, in one of his letters, "what that honey is which the Bees collect with so much ardour in the flowers, but you do not perhaps know that there are two kinds,—one, which is the real honey, is a juice of the earth, which, proceeding from the plants by transpiration, collects at the bottom of the chalice of the flowers, and thickens afterwards; it is, in other words, a digested and refined sap in the tubes of the plants: the other, which is called the honey-dew, is

an effect of the air, or a species of gluey dew, which falls earlier or later, but in general a little before, and during the dog days. This dew alights on the flowers, and the leaves of the plants and trees, but the heat operating on it, coagulates and thickens it, whilst on the other hand the honey which falls on the flowers is preserved a much longer time.

"It is said that an abundance of this honey-dew renders the Bees idle, and makes them careless of collecting the common honey from the chalice of the flowers. I however never saw them collect it but upon the flowers; one great disadvantage however of this honey-dew is, that if the season be foggy and moist, and especially if attended with small rain, this rain, or the too great humidity of the air, mixing with this honey-dew, corrupts it, and forms a composition very inferior to the honey of the first species, or to that, which has not undergone this adulteration.

"Those persons who have not viewed the honey-dew fall, like myself, have asserted that it is nothing more than the juice or sap of the plants, which, in hot weather, experience perhaps a greater fermentation, and by which it is forced through the leaves. In contradiction to this I assert, that it is perceived much better in the morning before the sun has been able to dry and harden it. Those persons are however deceived. I have not only seen this honey dew fall a hundred times in the form of a fine rain on the leaves of an ash, but I have also shewn it to others, and the globules were most distinctly perceived."*

* I cannot refrain here remarking, that the whole of the testimony of M. Ducarne runs the risk of being invalidated by the circumstance that the honey-dew never appears in moist weather; it is indeed its very preventive, being only produced by a sultry heat.

I have long adhered to the opinion, that the honey-dew dispersed on the leaves of the trees was only an exudation, although the form of the globules scarcely bore any resemblance to each other, but were rather an imitation of a species of rain. On examining more minutely different trees on which the honey-dew was apparent, chance led me to the discovery of a holm oak, on which the honey-dew had recently appeared, and in its primitive form, which is that of a transpired humour. The leaves were covered with several thousands of globules, or small round and compact drops, without however either touching or intermixing, similar to those which are seen on the plants after a thick fog. The position of each globule appeared to indicate, not only the point from which it exuded, but also the number of the pores or the glands of the leaf in which this mellifluous juice had been prepared. I assured myself that the honey-dew possessed the real colour of honey, which alone was sufficient to decide on its origin, without at the same time removing the doubts which a contrary prejudice establishes. The honey-dew of a neighbouring bramble was not constituted the same, the little globules had no doubt commixed; or being united to each other, either by the humidity of the air, which had dilated them, or by the heat which had promoted their extension, they formed large drops, or broad layers, the dried matter of which had become more viscous. It is under these latter forms that the honey-dew is commonly perceived, and our surprise need not be great that exudation is not suspected as the cause.

In the season when I remarked the honey-dew in globules on the evergreen-oak, this tree bore two sorts

of leaves: the old ones of a close tissue, like those of the holly, or of those trees which, on the approach of winter, do not shed their leaves; and the new ones, which were yet tender, and which had shot forth only a short time. The honey-dew appeared constantly only on the leaves of a year old: the leaves were however still covered with the tufts of the new shoot, and consequently sheltered from all species of rime, or drizzling rain, which might have fallen; this is in itself a convincing proof that the honey-dew is not foreign to the leaves of the trees which are moistened with it, and that it never appears in any other place, as it is commonly supposed, as the new shoot of our evergreen-oaks, which ought to have been touched the first as being the most exposed, did not exhibit the smallest drop.

The same singularity struck me in regard to the honey-dew of the bramble, although, by the conformation of this shrub, all its leaves are exposed nearly equal to the air, or to the fall which would take place vertically. The honey-dew only appears on the old leaves, the new ones had not more than the new shoot of the oak, of which mention has just been made, the mellifluous juice not having had, without doubt, a sufficient time to be formed in the tender part of these vegetables, or to be extracted from the sap. It is probably only the long exposition to the air, perhaps to its intemperature, and especially to the sun which ought to be regarded as the true agent of this secretion.

To elucidate this subject further, the plants and the shrubs in the vicinity of the trees on which the honey-dew appears, but of a different species, and of

a nature less suitable to the formation of the juice of which I am now speaking, do not carry the least vestige of it. This honey never appears on the rocks nor stones under the trees on which it is generally found, which is a fresh proof that this species of liquid manna does not fall from the clouds like rain, as it would diffuse itself indifferently on all kinds of bodies, and would not appear only on certain vegetables, and even on some of their parts to the exclusion of the remainder.

The only objection which presents itself to this theory (and I must acknowledge that the experience of the most able naturalists is against me) is, that the dew is attracted by certain bodies, whilst it is not by others. But it is known that this phenomenon, which often rises from the earth, floats always in the air, where it obeys the least breath and the weakest attraction, and often attaches itself to the upper as well as the lower part of the leaves of the trees. If it fell like rime it would moisten indifferently every body. The acceleration of its fall would enable it to surmount the obstacle of the little repulsions which it would find in its course.

The ancient naturalists, of whom the historians were the mere echo, for a long time deceived their credulous readers with deluges of blood, and other more solid matters. It was the honey-dew, from partaking less of the marvellous, that the persuasion of its existence was more easy, as it was scarcely ever perceived on the trees but at a time when heavy clouds appeared in the air, during the sultry weather of June or July. It is not however thence that the honey-dew takes its origin, the clouds do not in this

case concur in its production, excepting that they occasion an excess of heat by reflecting the rays of the sun to the earth. The ordinary heat has no other effect than to make the most volatile juices of the plants transpire, whereas that which is extended to a higher degree expresses from them the fixed, or more viscous juices, like that of the honey-dew.

The filters, through which the mellifluous juice passes to the bottom of the flowers are as large or larger than those of the leaves, as there is always some of this juice in the *nectarium*, in whatever time the plant flourishes, and in the season, by no means favourable to transpiration. It has been found in the flower of the field, the arbutus, during the cold of November, and the Bees, invited by a flattering ray of the sun, hastened to collect it.

The circumstance however which favours in the greatest degree the illusion of the pretended fall of the honey-dew from the upper regions of the air is, that it is only the upper part of the leaves which is moistened with it. It has also been seen that the moisture appears only on certain leaves, that is, on the new ones, and those which are the least exposed, and this attraction or attachment is not the effect of chance. It is further known, that it is on the side of the leaf where the pores are most open and distinguished that the greatest exudation of the plants takes place. It is there that the excretory vessels unite, by which the humours of the plants escape in the same manner as the absorbents, which serve for their nutrition in attracting the water of the rain, and the vapours which are diffused in the air.

If the different proofs be now collected which

have been advanced, it may be considered as undeniably proved that this honey-dew exudes from the leaves of certain trees, and it does not fall from the atmosphere.

Having now investigated the nature of that mellifluous substance which is found on the leaves of trees, it now remains for me to describe the source of another species of honey-dew, and to which we are indebted to the sagacity of M. Boissier de Sauvages, of the Royal Society of Sciences at Montpellier.

M. Ducouedic also pretends to have observed the same phenomenon, although I acknowledge that it not only exceeds my belief, but also my comprehension: still we have the asseveration of two experienced naturalists; and the circumstance of its not having been observed in this country may proceed from the diversity of the climate, which is not congenial to the growth of the insect.

"This second honey-dew," says M. Boissier de Sauvages, "is far removed from being celestial, being produced immediately by a vile and hideous insect, or which to us appears as such: it proceeds from a mean grub, and it is nothing else than its excrement; still it is the most delicate part of that honey with which we regale ourselves. It is certain that this excrement, which is fluid, and which deserves rather the name of elixir, is not in any degree inferior to the other honey-dew in sweetness and flavour."

"These grubs extract this fluid through the bark of certain trees, without committing any other injury, or causing any deformity, similar to that which is produced by the species which shrivels up the leaves, or that, whose stinging gives birth to a kind of gall-

nut on the buds of the elm and other trees. They remain immovable during several months of the year occupied with their labour, which is in extracting the sap with which they nourish themselves."

"These insects, early instructed in the sort of branches most proper for them, despise those which are new and tender, although they are more easily pierced, and only attach themselves to the branches of a year old, into which they inflict a sting, or dart, which serves them at the same time for a proboscis and sucker."

"It is in their stomach, or in the posterior part, that this juice, at first rough and harsh under the bark, assumes a sweet savour, perfectly similar, to judge by the taste, to that of the vegetable honey, but more analogous to that which exudes from the leaves, than that which is extracted from the chalice of the flower; and if this latter possesses it in greater quantity, it arises from its mixture with the essential oil of the flowers, which impart their different perfumes to the honey."

"These grubs are the only insects with which I am acquainted that are the real fabricators of honey. Their bowels are the true laboratories of it. This mixture, or a great part of its totality, is only the overplus or residue of their nourishment, which they void by the ordinary channels. The Bees, to whom the honour is given of fabricating the honey, are but the collectors of it; they discharge it into their cells, or magazines, without having made any sensible alteration in it."

"I have observed two species of these grubs that live openly under the bark of the young branches; they

are naked and without wings. I speak of the females which constitute the majority of the colony, and are the only ones which labour in the honey harvest. Every nest has two or three males in its suite, but they are like the drones in the Bee-hive: they live upon the labour of their companions:* at least I have always seen them walking with the greatest nonchalance on the backs of the female groupe, without troubling themselves about extracting the juice from the bark."

"Both species live *en famille*, and inhabit in clusters the different corners of the same tree. The grubs attach themselves one to the other round the branch, the bark of which they entirely conceal, and it is remarked that they in general assume an attitude which would appear to us uneasy. But each being has its particular customs, that of these insects is to stick to the branch with the head downwards. It may be presumed that they have their just reasons for this attitude, and which I shall develop in future."

"In the mean time it must be remarked, that the smallest of the two species partakes of the colour of the bark, on which they live, and which is generally of a greenish hue. They are distinguished by two fleshy fillets, straight and immovable, which rise perpendicularly from the lateral and inferior parts of their

* What is the food on which these grand seigniors in their seraglios live upon? Do these grubs collect any of the sweets from the trees for the purpose of nourishing them, or do they feed upon the excremental sweet of the female? The latter, I suppose, never entered into the head of M. De Sauvages, and, I believe, it would be perfectly new in natural history for the male to live upon the excrement of the female. This is not the least curious part in the history of these grubs, to whom we are indebted for our honey.

belly, or abdomen, one on each side. This is the species which inhabits the bark of the bramble, the elder, and young apple trees."

"The other species is twice as large, and which I have principally in view, as it distils the honey which the Bees collect. It is of a blackish hue, and possesses not the two fleshy lumps like the former species, but it is marked on this part of the skin with a little pimple, black, and shining as jet."

"Aware of what had been advanced by some naturalists, and which I have seen repeated by others, I believed that these projections at the bottom of the body were, as it has been maintained, the receptacle of a liquor of which the ants are very greedy; but on inspecting them more closely, I observed that the matter which attracted the ants had a different vent, in the great and the little grubs, and that nothing more exuded from the fleshy protuberances on their extremities, than from those which the caterpillars have on their tail."

"Some Bees presented me with an opportunity of elucidating this matter. Their humming in the middle of a tuft in an evergreen oak, gave me reason to suspect that some particular interest attracted them thither. Although I knew that it was not the season of the honey dew, nor the place in which it was generally found, I saw with surprise that the leaves and the branches in the middle of the tuft were entirely covered with it. It was a real fête for the Bees, who, humming in a joyous manner, collected the mellifluous globules."

"The singular form of these globules attracted my attention, and occasioned the discovery which I am

now relating. Instead of being round like those which proceed from the exudation of the leaves, these globules formed each a very elongated oval. It was not difficult to discover the place from which they had issued. The soiled leaves, to which the Bees attached themselves, were placed under one of these swarms, or nests of great black grubs. On examining them I observed some of them at times, who, rectifying their abdomen, forced a little drop of transparent liquor to appear at the end, which in an instant afterwards they ejected some inches distant. I found on applying those to my mouth which I had collected in my hand, that they had the same taste as those which exuded from the leaves of the trees."

"I had an opportunity of observing the same manœuvre in the smaller species; they ejected the drop from the same part, in the same manner, and in a parallel situation."

"This ejection, which alone gives to the drop an elongated form, is not in other respects an indifferent thing for these insects; it appears, on the contrary, to be regulated by a wise policy to preserve cleanliness amongst them, or to protect not merely the insect itself which ejects this excrement from all dirt, but its companions associated with it, who without this manœuvre would be soiled, and soon rendered incapable of acting."

"It must indeed be understood, that if the drop were ejected without an effort, or exertion, the insect which ejects it, being in the attitude of the head downwards, the excrement would in the first place fall on the Bee itself, before its companions were soiled with it. But it may be asked, what benefit can accrue from such

a singular position? There is every appearance, that there is nothing revolting in the habits of these grubs, which is not necessary to them, or at least which is not very convenient for the purpose of ejecting the honey with advantage.

"In order to form a proper judgment, it is only required to observe that their belly, or abdomen, is twenty times larger than the remainder of their body, that is, the head and the body taken together, and it is as much as they can possibly do to drag their hinder part slowly after them. But if this insect were in an attitude contrary to that which has been represented, it would be more difficult to raise this heavy mass from the bottom to the top, when it is engaged in contracting itself, that the ejection of the drop may clear the group and pass beyond it; whereas having the head downwards, and the belly uppermost, the insects have not occasion to make so strong an effort to incline a little forwards, when they feel any occasion. Notwithstanding all the advantage which this situation bestows upon them, it appears that, in order to collect their strength, they are subject to a kind of shivering or fluttering."

"It is only in the summer that this phenomenon presents itself. As winter approaches, the cold or the rains oblige the insects to shelter themselves under the branches. As they now extract but very little juice from the bark, and their ejections are seldom, they place their body indifferently with the head upwards or downwards.

"The drops of the ejected liquor, falling on the ground, owing to no leaves or branches intervening, the stones are for a long time spotted, if no rain comes

to wash them. It is the only honey that may be said to fall; but its fall never takes place beyond the range of the branches to which the nests of the insects are attached."

"The Bees are not the only insects that appropriate to themselves this delicacy; the ants appear to have an equally established right to it, and are as greedy and covetous of it. Naturalists have already observed the appetite of the ants, without knowing the reservoir which is the object of it. They encircle the swarms of these honey insects, to watch the moment in which this manna falls. It is very differently constituted with the Bees; the ants, who live by their daily labour, work but on their own account, and we derive no advantage from any surplus which they may obtain."

"Two sorts of ants go in search of these insects; each has its separate district, and appears to hold that of the other sacred. The great black ants of the woods have their department on the black insects of the oaks and the chestnuts; the smaller ants pay their court to the insects on the elder, and the bramble. The organs of neither one nor the other are proper to collect the honey, which is coagulated on the bodies on which it has fallen. This, they abandon to the Bees, whose workshop as it may be called is underneath, and they establish themselves at the source, to seize it instantaneously, as has been already noticed, when the desired liquor appears in the form of a globule at the end of the anus."

"Certain plants furnish very little extract for these insects, and whatever is ejected by them, is immediately imbibed by the little ants. It is so much the

more easy for these latter parasites to suffer no part of this excremental liquid to be lost, as the fæces of the young insects remain a short time permanent at the point of the anus, without being ejected, and which deprives the Bees of all hope of gleaning any thing after the small ants."

"Other trees, beside the oak and the chestnut, furnish a much greater quantity of this elixir to the great black insects, especially when the leaves are in full sap; but the Bees, who appear to live but on the offal, or on that which escapes the vigilance or the address of the great ants, are still in reality better served; having the proper organs for collecting the honey which has fallen, they collect that ample provision which they cannot consume themselves. If this desire of accumulation did not turn to our profit, we should be inclined to tax them with avarice, of which the Bee is much rather the emblem than the ant; the greatest collection is made during the abundant sap of June, at which time the insects finding on their part a more easy nourishment, imbibe a greater quantity from the bark. Hence their vigilance increases, the population becomes greater, and by a natural consequence, their ejections multiply, and are more frequent."

"These ejections are more seldom in autumn; I have however seen them at the end of October on the chestnuts and the oaks, which were already stripped of half their leaves. Other insects, which at the same period were exposed to the north-east wind, yielded but a very little quantity; the honey from one and the other died away on the trees without any utility. The Bees at that time preferred the honey

from the flowers of the shrubs which were in their vicinity, and neglected the animal honey, that is, the ejections of the insects.

"The great black grubs which are disdained, and which are indiscriminately and without pity killed by our agriculturists, as a destructive species, merit certainly on our part a much better treatment, or at least they ought to have some mercy shewn to them on account of the honey which they furnish to the Bees. If, on the other hand, as it is granted that they do not commit any injury to the tree, the propagation of these little insects were encouraged, the services which they render us would be multiplied, and the harvest of the Bees augmented."

The more we apply ourselves to become acquainted with the different productions of Nature, the more we shall perceive, that if they do not tend immediately to our advantage, they at least have a close relation to those ends which ought to make us admire a profound intelligence, and an infinite wisdom in the sovereign author, who is the principle of them.

Having now spoken of the origin of honey, it remains for me to describe the manner in which the Bees collect and deposit it in their cells. When a Bee enters a flower, which has near to its bottom those glands or reservoirs destined to contain a mellifluous liquor, and with which they are well filled, it finds a certain quantity of that liquor, which has exuded through the membranes of the cells, in which it was enclosed.

The bottom of a flower, may thus be said to be

covered with a species of honey, or saccharine juice, like the leaves of the trees, of which I have already spoken.

The proboscis, of which a description has been already given, is the instrument with which the Bee collects this liquor. It is not difficult to perceive the activity and address with which it makes use of it.

It is probable that when the Bees do not find a sufficient quantity of honey in a state of exudation, they make use of their teeth, and exercise them in opening the veins or glands which contain the mellifluous liquid. It is by means of their teeth that they open the cells in the hive, in which the honey has been stored; and why may they not make use of them in effecting a passage into the vessels which are filled with honey?

The Bees give no other preparation to the Honey than to purify it in their stomach. It is in this laboratory, that it assumes that thickness and condensity which it did not previously possess, and also that constitution of fragrance and taste, which are peculiar to it. When their stomach is properly filled, they return with it immediately to the hive, and disgorge the contents into the cells.

It is owing to the consistency which it has obtained in the stomach of the Bee, that it is prevented from running out of the cell; and the Bees in constructing their cells form a border round them, which enables them to fill the cell to the brim, and even to give the liquid a convex shape. From what has been advanced in this chapter, it may be confidently asserted that there is no fact more firmly established in

the natural history of the Bees, than that they swallow the honey which they collect from the flowers, and afterwards deposit it in their cells. The existence of a stomach, which has no communication with the organs of digestion, is a sufficient demonstration.

CHAP. XV.

ON SWARMS IN GENERAL.

In the spring, when a hive is well-peopled with many thousands of young Bees, a particular period arrives when they look out for another asylum than that of their mother. A swarm is therefore nothing more than a colony of Bees, which we see forsaking their native home to establish themselves in other parts.

It has been asked by many authors, why a swarm forsakes a favourite habitation which is provided with every necessary for its support, to expose itself to an uncertain situation, and one in which every necessary is wanting. The emission of the swarms is however nothing more than the execution of the law of the Creator: *increase and multiply*. In fact, if this emigration of the Bees did not take place, their species could not propagate, and the race would have been long since extinct. There are, independently of this general law, other particular circumstances and foreign causes, which, in certain years render the Bees more or less prolific, and there are some, in which they appear to be wholly struck with sterility. Certain causes

may combine to render one hive more forward than another, and consequently enable it to throw its swarm earlier than any other hive in the apiary. In general the small hives well furnished with provisions and Bees, at the commencement of spring, swarm two or three days before the larger ones, although both have the same aspect, and feed upon the same pasture.

It appears therefore that a great number of Bees in a small space, and their natural heat augmented by that of the atmosphere, oblige the swarms to abandon, either sooner or later their mother hive.

In regard to the time in which the Bees cast their swarms, it differs in all countries. According to M. Mentelle, the hives in the Isle of Cuba throw their swarms during the whole of the year, and Don Ulloa says that one is cast every month, and sometimes two. In Europe, however, the spring, or the beginning of the summer, is the time when the swarms appear, but this is regulated according to the forwardness or backwardness of the season.

In England the swarms generally appear in the months of May and June. I have however known a swarm in the vicinity of Stirling, in Scotland, so early as the 24th of April. In France the time of swarming is generally reckoned from the 15th May to the 15th June, according to the forwardness of the season. In Italy the swarms take place about the first week in May, and sometimes in the latter end of April. In Sicily the swarms appear the latter end of May. It is therefore evident that their emission from the hive depends on the greater or less mildness in the temperature of the climate, and on the appearance of fine weather. These two events not depend-

ing on human interference, nor ability, we cannot offer any assistance to our swarms in this respect.

The emigration of this colony does not take place if there be not a young queen to perpetuate the empire, which is about to be established. When a young queen has emerged from her nymphal state, she is capable of laying eggs in the space of three or four days, and she would lay them if she had a particular establishment of her own, independently of the mother hive, in which the young queens never possess the privilege of laying their eggs. She is however in a state of placing herself at the head of a colony, disposed to share her fortunes. Such is the attachment of the Bees for their queen.

The first swarm which appears in the spring is always in part the produce of the eggs which were laid the preceding year. These eggs have subsisted in the hive during the autumn and winter, in the state of eggs fecundated by the drones. These eggs are not hatched until the return of the warm weather in April, or May, and the drones, which are the produce of these eggs, as soon as they have quitted their nymphal state, fecundate the eggs which the queen has already laid in the cells of the present year.

The most important points with which the young apiarian should be made acquainted, are the signs which generally present themselves for some days previously to the actual appearance of the swarm, and they may be reckoned seven in number:—1st. An extraordinary number of Bees which hang in clusters about the entrance of the hive; 2d. an apparent idleness which reigns amongst the Bees; 3d. a particular noise which is made by the young queen,

similar to *chip, chip,* which is distinctly heard two or three nights preceding the swarming;* 4th. an unusual bustle amongst the drones; 5th. a sudden silence succeeding a violent uproar; 6th. the continual motion of the wings of the Bees, which stand at the entrance; 7th. violent commotions at the entrance of the hives, and the Bees crowding out in great numbers.

Implicit confidence must not however be placed on any of these signs, for although they are certainly indicative of an approaching swarm, yet they may, and also do happen at other seasons, when there is no prospect of a swarm. The clustering of the Bees will, for instance, take place when the heat of the interior of the hive is too great, or when the Bees have not sufficient room in which to work. The cause of the motion of their wings has long been an object of investigation amongst naturalists, and, as it may

* The capability of the queen to utter any noise has been much doubted; on this subject the Abbe della Rocca relates a curious anecdote. A person, not very skilful in the management of Bees, was appointed to deprive a hive of a part of its honey, and in the operation he wounded the queen. She immediately issued a most plaintive cry, and the Bees attacked instantaneously all the spectators and the animals in the vicinity. A horse of the archbishop's was by chance tied to a tree contiguous to the apiary, and it was attacked with so much fury, that it broke the reins, and took refuge in a country house; but the Bees pursued it with so much acrimony, that it mounted the stairs of the first story, and burst into a room full of company, to whom he was no doubt an unwelcome visitor.

The German apiarians give a singular reason for the notes which are supposed to be uttered by the queen. They assert that this noise denotes the existence of some rival queens in the hive, who, at the moment when the mother queen is in the act of coition with a drone, make that chipping shrill noise as a mark of jealousy and envy.

be supposed, various causes have been ascribed for it. I think however the most rational one is, that it is for the purpose of ventilation, although I am convinced at the same time that it is a sign of joy. I have experienced this so often in the recovery of Bees chilled with snow, or suffocated in any glutinous substance, that no doubt can be admitted of it. On a summer evening ten or a dozen Bees will be often seen in the attitude of moving their wings, and some will be at that distance from the entrance that no possible benefit could accrue from their motion. It certainly acts like the ventilator in a room, but whether it be for that express purpose, or merely as a token of happiness, cannot be positively ascertained.

To guard against the fallacy of these signs, the most prudent method is to keep or appoint a regular watch, from the hours of nine A. M. to three P. M. Many persons select children for this purpose, who are often led away by a trifle, and thus the swarm, the chief profit of the proprietor is lost to him. The following anecdote will verify this fact:

A farmer, resident in the neighbourhood of my house, was obliged to absent himself from home, and he charged his son to watch one of his hives, which was expected to swarm. The father, on his return, inquired of his son if the hive had swarmed. O yes, replied the son, and he pointed out the place where the swarm had alighted, but it had disappeared. The farmer reprimanded his son; but the latter exculpated himself, by saying, "you only told me to watch if the hive swarmed, and I did not know that I had

then any thing more to do." The swarm was consequently lost from the ignorance of the person appointed to watch it.*

The departure of a swarm is one of the most gratifying sights to an apiarian, and it well repays him for many hours of anxious watching. The hive seems in a state of the greatest commotion; the Bees appear as if some powerful enemy had taken possession of their hive, and were expelling them from it by force; the whole community appears in a state of emigration, and thousands are seen circling the air in all directions. The first Bees which leave the hive return, hover for an instant before the hive, and rise into the air: the whole swarm then leaves the hive, attended by the queen, and repairs either to some previously chosen spot, or fixes on the branch of an adjacent tree or bush.

It has long been a matter of doubt with apiarians, whether the Bees send out, what may be called their advanced guard, to select a proper place for the establishment of their new colony. As far as my opinion may be valid, I have not the slightest doubt of the fact, for I have witnessed it so very often. I once possessed a small apiary at a gentleman's house in Scotland, and the time of swarming of one

* I was once witness to a singular circumstance respecting a swarm, and which ought to be a warning to persons not to fasten any animals in the vicinity of an apiary, during the swarming season. A man, who did not perceive that he was in the vicinity of a hive on the point of swarming, tied his ass to a post: the hive swarmed, and fixed itself on the muzzle of the ass; the patience of the animal could not brook the strangers, and it began to rub its muzzle on the ground. The indignation of the swarm was roused, and the animal was so stung that it died in three days The swarm was consequently lost to the proprietor.

of the hives was regularly known by a scout appearing in one of the chimnies, when we were always obliged to cover it over a with sack, to prevent the swarm from entering.

Mr. Knight in a letter addressed to Sir Joseph Banks, and which is inserted in the Philosophical Transactions for 1807, has verified this fact:—It is not however of recent discovery, for various writers have mentioned it, especially Saint Jean de Crevecœur, in his Letters *Du Cultivateur Americain;* the first of which is of 1770, and at the sixty-second page of the first volume, he thus expresses himself: "One of the problems most difficult to solve, is to know when the Bees will swarm, and whether the swarm will remain in the hive provided for them, or escape to establish themselves in the cavity of some tree; for *when, by the means of their emissaries, they have chosen themselves a retreat, it is not possible to retain them in any hive which you may select for them.* I have several times forced swarms to enter into hives which I had prepared for them, but I always lost them towards the night: at the very moment when I the least expected it, they flew away in a body to the woods."

In regard to this observation of St. Jean de Crevecœur, it is also my opinion that Bees kept in an apiary in the vicinity of woods, when they send forth their swarms, have always a propensity to lodge themselves in a tree which is in their vicinity, because it is their natural and primitive habitation.

Duchet, in his Work on Bees, printed at Vevay, in 1771, says, p. 25. "I have seen more than once that swarms, *before leaving the hive,* have sent forth

their foragers to provide a dwelling in the cavity of a tree, about a quarter of a mile distant, and the swarm repaired to it by the nearest road, and with a celerity which would have defied the fleetest horse."

M. Ducarne says, "*that he has seen this advanced guard sent forth before the swarm.*" I can only remark that, although I am positively convinced of the fact, yet I will venture to assert that the actual verification of it never yet took place.

Dubost, in his Work on Bees, says, p. 69. "Let it not be supposed that a swarm departs on mere hazard; it would be forming an erroneous opinion of those insects, which, to the eye of the observer, present so many proofs of intelligence. This assertion is not mere conjecture, it is founded on facts, of which I have been witness; and the following is the most striking:—I was walking one morning about nine o'clock before my apiary, examining the motions of the Bees, when I perceived some Bees enter, and depart from a hive which I knew was empty, and which had never been made use of. Anxious to know the purport of their visit, I inspected the interior, and found about a hundred Bees, who ran about the hive apparently in great confusion. I was struck with this singularity, without being able to attach any particular cause to it. During dinner I was informed that a swarm was seen on the wing, and was believed to come from one of my hives. Although I was certain that it did not belong to me, I could not resist the pleasure of observing its flight. I had no sooner arrived in my garden than I saw it direct its flight to my apiary; recollecting the observation

which I made in the morning, I conjectured that they were going to take possession of the empty hive. The case was really so; and two other apiarians afterwards informed me, that the same occurrence had taken place amongst their hives."

According to all these observations, and the certitude which exists, that in the forests in the north of Europe the wild Bees seek their own habitation, either in trunks of trees, or in blocks hollowed by the art of man, I repeat that it is my firm belief, that a swarm previously to emigration sends forth an advanced guard in search of a dwelling, in which the colony can establish itself, and where it is safe from all the accidents of the weather.

I have known many proprietors lose their swarms from a negligence in providing themselves with new hives: this is unpardonable, and to such persons any advice is like a pearl thrown to swine. Circumstances may however combine to thwart the precaution of the attentive apiarian; in this case there are various vessels and utensils which may be used in the interim until a proper hive can be obtained. A pail, a box, or even a large garden-pot, will enable the proprietor to retain the swarm. I once knew an old woman, who, not having any other utensil at hand, took one from under her bed, but as it happened to be glazed in the inside, the Bees could not obtain a footing, and they forsook their unique habitation in search of a better.

It seldom happens that the first flight of a swarm is to any great distance, but it generally alights on a neighbouring bush. Every exertion should be then immediately made to hive it, for it will not stop above

two or three hours, especially if the sun beats upon it with violence, and even when they are hived they should be covered with a sheet, or tablecloth, to protect them from the heat.

No specific rules can be laid down for the manner in which a swarm is to be hived, as it depends on the particular situation in which it has fixed itself; if on a bush, all that is required, is to put the hive under it, and with a bough, or the wing of a goose, brush the Bees into it. Some persons place the hive over the swarm, and then, by teasing and provoking, induce them to ascend into it; but this system is very faulty, for the Bees will never ascend until the queen Bee sets the example, and it is very seldom that she can be caught in the swarm, being generally in the middle.

In general various devices are resorted to, to induce the swarm to fix themselves; such as beating frying-pans,* throwing water and sand. I am how-

* This method is strenuously recommended by Wildman, but I disapprove of it. I believe the origin of beating a sonorous body is to be traced to an intention on the part of individuals to apprise their neighbours of the departure of their swarms, and that it was afterwards considered as conducive to the settling of the Bees.

M. L'Abbé de Lille, in one of his notes to the Georgics of Virgil, gives a more striking origin to this custom of making a noise at the departure of the swarms. "It is probable," he says, "that this strange custom takes its origin from Pagan superstition, and from the custom which prevailed in the fêtes of Cybele, of striking on copper vessels in memory of a similar noise which the Corybantes made in favour of Jupiter. It is known that old Saturn being possessed with a mania of devouring all his children, his wife *Cybele* (Sybil) was anxious to save young Jupiter from his fury. He was therefore carefully concealed in a cave of Mount Ida, called *Dictys*, and there she engaged the Corybantes, who were her ministers and priests, to make around the cradle of her son such a thundering noise, that the cries of her infant should not be heard,

ever not an advocate for any of these experiments: the best method is to watch the swarm in silence, and after it has once collected to lose no time in hiving it. Many persons perform this operation without any safeguard to their person; I would however always recommend some covering being applied to the legs, the hands, and the face; for the consciousness of security imparts a greater degree of boldness and presence of mind, and these are two qualities which are indispensable in all operations connected with the apiary.

In all operations with the interior of the hive, or in the management of swarms, the head should be covered with a cap, over which a linen hood should be thrown, having a mask of iron wire, which is more commodious than glass, horse-hair, or gauze, through which it is difficult to respire. The hood should fall below the shoulders, that it may be fastened round the body, to prevent the Bees slipping beneath (see pl. V. fig. 6 and 7). The gloves should be of the coarsest worsted, through which the sting cannot so easily penetrate as through leather; they should be lengthened with linen so as to extend far up the sleeves: gaiters should be used for the covering of the legs. The Bees sometimes excite each other to anger by a particular motion of their wings on the stigmates of their body, which occasions rather a sharp

It is also known that the Bees played a conspicuous part with the Corybanthes in this business, and it was owing to their honey that Jupiter was indebted for the preservation of his life; they had therefore the honour of being the nurse of the greatest of the gods. It is strange, concludes M. L'Abbé de Lille, "that a custom in itself so useless, so ridiculous, and founded on a tradition as absurd and puerile, should in our days be persisted in, and that our farmers perform daily, without knowing it, the honours of the cradle of Jupiter.

noise. The agitation of the Bees of the hive, on which the operation is performed, soon communicates itself to the whole apiary; the smoke of linen or of dried calf's dung* must then be used. For the operation of smoking, it is proper to have one or two iron stew-pans, to which a wooden handle may be affixed. A cover is attached to it, bored with holes, and fastened with a hinge. This cover prevents all danger of fire, and also the Bees from falling into it (see pl. III. No. 5.) On altering your position, the smoking pan must be carried with you, as the Bees will not then approach you, fearing nothing so much as smoke.

Bees should never be breathed nor blown upon at the entrance of their hives, because the air which we respire irritates them much. If they are blown upon with a bellows, they rather fly than put themselves in a rage. A great light dazzles them; it is therefore much better to perform any operation upon them when the sun shines bright, than in cloudy weather, or from ten o'clock in the morning to two in the afternoon, and at twilight rather than in the obscurity of night.

In the management of swarms some attention should be paid to the dress. The clothes should not be of a dark colour, neither black, brown, nor blue, for in their rage they fly immediately to the hair, the eyelids, and other dark parts of the body.

When the swarm is hived, and the Bees appear restless and confused, it is a certain sign that the

* In order to procure the dried calf's dung, it must be gathered when it is fresh, and thrown against a wall exposed to the sun. It will soon dry, in such a manner, that, on taking it away, it may be reduced with ease to powder.

queen is not amongst them, and the Bees will soon return to the parent hive. The most prudent method to be adopted in this case is to examine the parent hive, and, as at this particular season there are in general a number of queens in a hive, to take possession of one of them, and unite her to the swarm: they will receive her with every demonstration of joy, which will be perceptible by the motion of their wings occasioning a loud humming noise.

It sometimes happens that a swarm divides itself into different clusters; this is a certain sign that there are several queens, each cluster having one. It is advised by some apiarians to leave them in this state, as the lesser cluster will attach itself to the larger, and the queens, finding themselves forsaken, will also join the general groupe: this is however a useless waste of time. The Bees, in forming a spontaneous junction, evidently shew the method which ought to be adopted; and therefore the clusters ought to be joined with all possible despatch, leaving it to the judgment of the Bees to kill the superfluous queens.

It frequently happens, in an extensive apiary, that swarms from different hives will form a junction, in spite of every endeavour to prevent it. In the case of their being second swarms, this circumstance would not be prejudicial to the proprietor; for, on their being hived, the Bees would kill the superfluous queens, and one good stock would then be formed, which at any time is better than three weak ones. But, supposing them to be first swarms, it is the interest of the proprietor to keep them separate, and their junction is therefore a calamity: it has however its remedy, and the following is the process to be pursued:

The swarm being collected into one hive, a sheet must be spread on the ground, the hive must be held over it, and giving it a smart knock the Bees will all fall upon it; no fear whatever need be entertained of them flying away, and the search must be immediately instituted for the queens. The presence of them may be ascertained by small groupes being collected around them. Having attained to the certainty of a queen being in the midst of a groupe, cover it with a small bell glass, and then proceed to divide the Bees, as near as possible into two equal proportions. For this purpose two hives must be in readiness, and having given a proper number to the queen, who is at large, the hive is placed in a remote part of the garden, and as far from the parent hive as possible. The imprisoned queen is then set at liberty, and she is conducted to her hive, with that proportion of subjects which has been assigned to her by the division. The whole being placed in the hive, it is carried as far as the premises will admit in a contrary direction to the former hive. A little confusion may at first occur, but if a certainty exists that there is a queen Bee in the hive, and this must depend on the attention and experience of the proprietor, perfect tranquillity and peace will be found restored on the following morning. No further fear then remains of a reunion.

Supposing the swarm to be hived in the morning, which is the general time of swarming, the hive must not however be moved until late in the evening, in order that sufficient time may be given for the stragglers to return. I have always observed that for two or three days subsequently to the swarming, the Bees

are always hovering near the spot on which the swarm first alighted. I have even seen them cluster, but at night they invariably disappeared.

In regard to the different methods which have been adopted, not only by the ancients, but the moderns, to encourage the swarm to enter the hive, by rubbing it with odoriferous herbs and honey, I am convinced that the best preparations are cleanliness, neatness, and absence of all offensive odours; but it is not the most aromatic odour, which would induce the Bees to take possession of the domicile which is offered to them, if they were not properly provided with a queen. In Italy and France they rub the hives with the leaves of garlick and onions; and Contardi, who was well instructed in the economy of the Bees, goes so far as to assert that the Bees accustom themselves to this odour from the want of a better. If we compare this statement with that of the Abbé della Rocca, and take into consideration at the same time the experience of apiarians in general, some surprise at the hardy assertion of Contardi must necessarily be excited. "It is certain," says L'Abbé, "that we should particularly refrain from approaching our Bees when we have been touching either garlick or onions, or even when we have been eating cheese, as we are then sure of being attacked with great acrimony."

The only method of discovering the value of a swarm is by its weight, although it is still asserted, by many, that the size is a true criterion. This latter opinion is erroneous; for the size of a swarm, in a great measure, depends on the temperature of the air; if it be very hot, the Bees will extend themselves, to admit a greater influx of air,—and, *vice versa*, if

it be cold they will crowd together, to increase the heat by reciprocal action. The weight is therefore the best criterion, and this can be effected by first weighing the hive when empty, and then again immediately after the swarm has been put into it.

The best swarms are from five to six pounds. I have known one to weigh eight, but this is a phenomenon;* nor are these very large swarms desirable, as they impoverish the parent hive too much. Five thousand Bees weigh about a pound; a good swarm consists therefore of about 20,000 Bees. The quantity of honey which a swarm carries along with it, for its sustenance, has been ascertained from the following curious circumstance: In some countries, particularly to the south and south-east of Europe, it is customary to put a swarm into a bag, and this originates in the propensity of the Bees to lodge themselves in the woods, in which it is the particular office of certain persons to collect them. A person having once collected a swarm in a bag, he suspended it to a tree, whilst he went in search of some other swarms,—a most ardent sun killed the Bees, but more than three pounds of honey were collected from them, leaving some behind. It may therefore be quoted, that about four pounds is the quantity of provisions which a swarm takes with it.

In regard to the second swarms, *or casts*, the difficulty of ascertaining the precise time of their flight is very great, as none of those evident signs are displayed which mark the rising of the first. I hope

* M. Ducouedic affirms that he has had swarms from twelve to eighteen, and twenty pounds. "I would not put my name to such a tale."

however still to give those *secondary* signs by which some tolerably accurate notion may be formed of the departure of a second swarm.* It may be generally

* I am certain the following account of a second swarm will be read with great interest: it is extracted from the Feminin' Monarchie of Butler, and it is another proof what singular *crotchets* enter into the heads of apiarians. It is in the edition of 1634.

Wen de prim swarm is gon; (if de stok sall cast any mor') de eigt or nint æwning after, (soomtim' de tent or elevnt) de next Princ' when see perceivt a competent number to bee fledg and reddy, beginnet to tun' in hir treble voic' a moornful and begging not,' as if see did pray her qeenmoder to let them go'. Unto wic voic' if de qeen' vouchsaf' to reply tuning hir *Bas'* to de yung Princes *Treble;* (as commonly see will, dowg soomtim' scarc'ly entreated in a day or two) den doo't see consent; and der'for', (unless foul weder stay den til it bee too lat') you may assuredly look for a swarm. Wic seldom ariset de next day, aldowg de weder bee very pleasant, or de next day, unles de weder bee very pleasant; but after de tird nigte warning dey will accept indifferent weder; suc as de prim' swarms will not coom abroad in. And as de qeens voic is a grant so hir silenc is a flat denyall; de proverb heer hat no' plac' (*qui tacet consentire videtur*) for witout dis concent der' is no' concent.

Dis song beeing conteined witin de coompas of an *Eigt (from c-sol-fa-ut to C sol-fa)* de Princ composet hir part, witin de fowr upper clefs (*G, A B and C*) usually in triple mood; beginning wit an od *minim* in *G-sol, re ut*, and tuning de rest of hir not's wer' of de first is a semi brief in *A-la-mi-re*. Soomtim' see taket a higer key, sounding de ad minim in *A-la-mi-re*, and de rest in *B fa-b-mi*. Soomtim' specially toward deir cooming foort', see riset yet higher to *C sol-fa*; holding de tim' of tree or fowr semibriefs, mor' or less. Non and den see beginnet in duple tim' soom two or tree semibriefs; but always endet wit *minims* of de triple mood.

De qeens part conteined witin de fowr lower clefs, consistet of *minims* altoge'der in triple mood; commonly in *F fa-ut*, soomtim' in *C sol-fa-ut*, soomtim' in de oder two clefs between 'dem; continuing her tun' de tim' of nin' or ten semibriefs, mor' or less.

Soomtim' a tird Princes imitating de qeen's voic' in tim' dowg differing haply in tun', joynet wit dem; de mor' wit deir ful-noys, to incit' de swarm to go dat hir turn may coom de sooner. And soomtim' a fowrt also interpost hir minims to fil up de qir. But non' dar' counterfeit de voic of de cief Princ; for dat wer treason to hir person; and yet soomtim' on' of dem in hop' to part de swarm, will steal out wit her; wic if de swarm bee not parted, or being parted be put togeder, costeth hir

looked for on the 8th or 10th day after the first swarm. Some hives however never throw a second swarm at all, and this may in some degree be ascertained by inspecting the hive immediately after the first swarm has departed. If the combs are bare and destitute of Bees; if the supernumerary princesses are seen dead before the hive; if the Bees tear from the cells the nymphs of the drones, no second swarm is then to be expected.

Independently of the dead queens which are thrown out of the hive, it must also be examined if the Bees withdraw from the cells the royal nymphs: the massacre of the queens is then a certain sign that there will not be a second swarm, but if the Bees are satisfied with only killing some queens, without destroying the nymphs at the same time, the chances of a second swarm then are great; and for the following reason:—It often occurs, that previously to the departure of the first swarm there are three or four queens in the hive, and each ready to place herself at the head of the new colony. Of these three or four

liff, v. as well as de liv's of soom of hir followers. Notwitstanding eac' of des when hir elder sister is gon and hir turn next, can get hir not, begging in Orithyas tun leav to bee gone too, wic as soomtim' de queen grantet unasked, beginning first hirself, so soomtim' by hir sideus she denyet, dowg moornfully intreated, and then de swarm tarryet, and de poor lady must di.

Wit des various and harmonious not's answering on an oder, and soom paus between; dey go solemnly round about de hiv, so to giv warning unto all de coompany. This dey continu daily until deir swarming, but you may hear dem best evenings and mornings. Wic musick as it cannot but pleas and deligt dem dat listen to it, so must it bee most sweet and pleasant to de yung Princ hir self unto wom der' by is proclaimed a warrant not only of hir lif,' but of a kingdom also, but wic oderwis bee wer sur' to los'.

queens, but one, and seldom two depart with the first swarm, and the others remain in the hive, probably to place themselves at the head of the second; but the Bees seeing that the population is not sufficient to support a second emigration, before the brood could furnish fresh recruits, sometimes kill all the supernumerary queens which are hatched, especially if they have exhibited any proof of rebellion against the mother queen; for it has often happened that the young queens, full of ambition, have succeeded in dethroning and usurping her place. Thus whilst the population of the second swarms is completing, other queens are born, who depart with them.

For this reason the massacre of the queens ought to be accompanied with the expulsion of the royal nymphs, in order to form the just conclusion that the hive will not throw a second swarm.

Notwithstanding all these indications, it still sometimes happens that a hive throws a second swarm, and if some reason be required for it, I am inclined to attribute it to a certain number of Bees collecting round one of the queens destined for the second swarm, and whom they have acknowledged for their rightful sovereign.

Although none of these signs present themselves, I would still advise the proprietor to keep an attentive watch upon his hive, from nine o'clock to about three, from the 5th to the 12th day, after that time he need not look for any second swarm.

A second swarm in this country is very seldom worth preserving through the winter, as the stock of honey which it collects is not sufficient to maintain it through a mild season. Should two second swarms

be thrown off at one time, the junction should then be immediately made, and by a combination of strength and power, a sufficiency of provision will be collected; but should that fortunate circumstance not occur, the Bees of a second swarm should be joined to some strong hive at the close of the season. This operation will repay the apiarian, as he possesses himself of the honey which the second swarm had collected, and his stock hive will be enriched by an accession of inhabitants. Various methods have been adopted to effect a junction of two hives;* and Bonner affirms that he has effected it by simply reverting one hive, and placing the other upon it, by which means the Bees in the latter ascend into the former, and they are received in the most hospitable manner. I have tried this method, and the result was,—that I lost both my hives from the sanguinary contest which took place, and the murder of both of the queens. On mentioning this circumstance, I was told that I had neglected the most important part of the operation; for that I should first have obtained about a handful of Bees from the second swarm, and, like a master of the ceremonies, have presented them at the entrance of the hive, which was destined to receive the new inhabitants, I should then have seen, by the manner of the Bees, whether they were willing to receive the intruders. On the first opportunity I performed this preliminary step, and with great humility and condescension, I introduced the strangers; but the result was, that I set one hive in complete commo-

* Some apiarians make use of fumigation for stupefying the Bees when they wish to form a junction, but I do not think it effectual.

tion, and occasioned the murder of the intruding Bees, who may justly be called the forlorn hope.

After mature reflection I fell upon the following plan, and I have invariably found it attended with complete success. From long and repeated observation, I am convinced that the Bees do not know each other from any distinctive personal marks, but from an odour peculiar to them, and which differs in every hive. From this conviction I was led to consider, that if by any means I could impart the same odour to two different families, I could then unite them according to the purpose required.* To put my design in execution, I made a mixture of sugar and ale, and a small quantity of honey. I diluted the whole with water until the quantity amounted to about four gallons. This liquid I placed in a tub, rather higher than the Bee-hives which I generally use for receiving the Bees when I drive them. I then take the stock hive to which the weaker one is to be joined, and, having gained possession of the Bees, I immediately immerse the whole in the liquid, and retain them there until life is almost extinct. I then drive the Bees from the weaker hive, and immerse them in the same liquid with the other Bees; and having well mixed them, by turning them round with a stick, I pour the whole mass into a sieve, and having drained all the liquid from them, I return them to the stock-

* The German apiarians are so fully convinced that it is by the particular smell that Bees recognise a stranger, that they always adopt the following plan on giving a queen to a hive: they confine her in a little cage which is placed in the hive, and in which she is suffered to remain about three days. She is then set at liberty, and the Bees accept of her as their monarch.

hive; then closing the entrance, I take the hive and place it at a short distance from the fire. In a short time a humming is heard, which is the sound of returning life: in the course of an hour the Bees are perfectly recovered, and I never knew that a single quarrel existed between them. This system is however not exempt from that danger which must necessarily accompany the junction of two hives; and that is, the possibility, and I may add the probability, of both the queens being killed; I therefore, if possible, contrive to catch the queen of one of the hives, and become myself a regicide.

If the day subsequent to the hiving of the swarm be rainy, and if it should continue so for a few days, it becomes advisable to give the Bees a little food. The quantity of honey which they bring with them from the parent hive will be wholly exhausted in a short time, and should they be prevented by bad weather from collecting some food in the fields, they will in time become so weak from the want of food, that, on the return of fine weather, they will be unable to take their customary flights. The food should be always given them at night, that no fear may be entertained of robbery by the other Bees. Whenever a hive is lifted, in which a swarm has been lately placed, particular care should be taken to perform it with great gentleness, because the combs, not having yet acquired a proper consistency, and being loaded with Bees, are very apt to break, which causes great confusion in a hive. I would in general advise, except it be for the purpose of feeding, not to meddle with the swarms for two months. They may

then be inspected without fear of incurring any risk of breaking the combs.

It sometimes happens in very fine seasons that a first swarm will throw a swarm; this, however, is not very common in this country, and in some respects it is not much to be desired, as from the lateness of the season in which the swarm appears, it can scarcely amass a sufficiency for its winter support.* The produce of this swarm is always called *virgin honey*, and is considered of the purest and most genuine quality. It would be more conducive to the advantage of the proprietor to prevent his swarm from swarming than to encourage it; and this can be effected by giving more room to the Bees, and by killing one of the superfluous queens.

Some persons are very apt to mistake the clustering of the Bees for an indication of an approaching swarm, and I have known them wait, with the greatest anxiety, for a fortnight, or more, in daily expectation of the forthcoming treasure. It is always with great regret that I see my Bees in this clustering state, and sometimes at the beginning of summer,

* M. L'Abbé Tessier says, "On doit veiller a ce qu'un nouvel essaim ne donne pas d'essaim la même année afin de ne le pas affoibler. Je suis cependant certain, ajoute il, qu'une ruche ayant produit un essaim à la mi-mai, quinze jours après en donna un second, et dix jours après celui ci un troisième."

De ces trois essaims, le premier dans la même année en donna un; ensorte qu'une même ruche a produit quatre essaims qui tous ont prosperé mais ce cas extraordinaire dependoit de circonstances qui n'ont lieu que très rarement. Un printems favorable, une abondance de Nel, un été chaud, voila les causes d'une multiplication si etonnante. Dans l'etat ordinaire on doit se contenter d'un essaim, et empêcher qui celui ci n'en donne un a son tour la même année."

two reasons can be assigned for it,—either some accident has befallen the queen, who was to place herself at the head of the swarm, or the whole space of the hive being filled with combs, and those combs full of honey and brood, the Bees, having no further room to work in, betake themselves to idleness. The former case will be treated of under the head of artificial swarms, but the latter meets with a speedy remedy. In my own hive I open it, and take out the two side bars, by which means I obtain an immediate supply of honey; and, having replaced them, the Bees will soon replenish the cavities. In the common hive it is merely necessary to give it an eek, of about four or six inches high, and the Bees will no longer lie out in clusters, but will immediately resume their active operations. I once visited a gentleman's garden, in which a few hives were placed, I believe more for ornament than for use, as no pains had been spared to make them a pleasing object to the eye. The proprietor had however been so careless of the actions of his winged tenants, as to suffer them from a want of room in their own hive, to work underneath the stand, and under two of the hives there were at least six large combs. He admired the curiosity of the thing, and I pitied his folly.

It is not possible to determine the precise number of swarms which a hive will throw, as this depends upon the fertility of the country and the climate. It seldom however happens that any but the two first are worth preserving, and every method should be pursued of preventing any more from leaving the hive.

After the departure of the swarms, it is difficult to

conceive in what manner the hives remain peopled; and there are some hives which are so enervated by the departure of the swarms, that they perish in the following winter, if some method be not adopted of increasing the population; but this even must be done with great caution, or the people will exceed the quantity of provision which has been collected.

Of artificial swarms Schirach may be quoted as the great advocate and abettor; I am not however so thoroughly convinced of their utility as to recommend their general adoption. There are however several methods of procuring artificial swarms; that of Wildman is, in extracting from a hive which is on the eve of swarming, or which has already swarmed, a piece of comb in which there are some royal cells: this comb is placed in an empty hive, and he introduces at the same time a certain number of common Bees, proper to form a swarm, but he does not explain in what manner he introduces the said Bees into the hive, in which he has placed the comb containing the royal nymph.

It is however the opinion of Schirach, that it is not necessary that the egg so transported should be a royal one; on the contrary the Bees have the power of creating any egg, which they may select, into a royal one; but I can most positively deny the metamorphosis of an egg, or a maggot, whose original destination was a common Bee into a perfect queen, because such a metamorphosis is absolutely impossible. It is in vain to allege against this assertion, the experiment which has been so often repeated, and which has always succeeded, of enclosing in a hive a certain number of common Bees, with a piece of brood-comb

full of eggs and maggots of common Bees; and that the Bees have almost always formed a perfect queen. Without calling the fact into question, and admitting it in its full entity, I may suggest, and I believe with a great deal of probability, that amongst those eggs supposed to be simple, there may have been one which would have naturally produced a queen. If this be the case, these facts do not prove any thing in favour of the pretended transformation of an egg into a queen.

An artificial swarm may be procured as soon as the drones appear, which is generally at the end of April, but the operation must be performed only in fine weather, which may be looked for in the beginning of May. The time when it should be performed is from nine in the morning till one, the weather being serene, and the sun shining.

The chief point is to force a proportion of the Bees of a full hive to pass into a second one, which some persons effect by knocking at the sides of the hive, but this method is not advisable, as it is apt to loosen the combs. Fumigation therefore should be used; but as it is known that the Bees which are driven, by whatever process it may be from a full hive into an empty one, pass very slowly, proceeding in a groupe, and not flying, the transition may be observed without fear, in order that the number of Bees may be ascertained that passes from one hive to another, and that it is neither too small nor too great.

I proceed in the first place to open my hive at the top, and having taken away the board and the netting, I apply immediately the board (fig 8. pl. V.) This board is necessary, as the lower part of the hive

being smaller in diameter than the upper, no junction could be formed so exact as to prevent the Bees from getting out at the sides. It has also this advantage, that as the Bees inhabit generally the middle of the hive, the expulsion of them is more easily effected.

I then provide a box of the following shape and dimensions: fifteen inches square, and seventeen high. Three of the sides are closed, and one open, having but two cross bars; one at the top, and the other nine inches downwards. The upper part of the box is pierced six inches square in the middle, which is covered with wirework, so close as to prevent any of the Bees from falling into the fumigating-pan, which, being placed within the box, the hive is put upon it.

These arrangements must be made with the greatest expedition and coolness.

The smoke driving the Bees from the full hive into the empty one, which is easily ascertained by a loud humming noise, the upper hive may be then gently raised, and the particular part will be seen, by which the Bees are ascending. When it is supposed that a sufficient number has left the parent hive, the fumigating-pan is removed; the upper hive is taken away, and placed on a moveable board, and the old one is restored to its former position.

The most important question now comes to be decided, which is, to which proportion of the Bees does the queen belong? or, in other words, has she ascended into the new hive or remained in the old one? This can hardly be determined for the first twenty-four hours. If a swarm be placed in an empty hive, without a queen, it will soon be seen that they construct no combs, that they are continually agita-

ted, and never cluster. But the Bees of the same hive, being divided into two, consider themselves as being in their own domicile, and they do not immediately perceive that there is not a queen amongst them. It is also a singularity attendant upon the absence of a queen, that the Bees appear to lose a great deal of their irascibility, and they are not so ready to make use of their stings as in general.

The question of the presence of the queen being decided, which nine times in ten proves to be in the new hive, the two hives must be removed to the distance of two or three hundred paces from each other, that the inhabitants of the new swarm may lose all remembrance of their former habitation; and it were also advisable that the old hive should be removed from its former position, and the Bees, not finding their habitation in its accustomed place, will be obliged to return to the hive from whence they departed.

The first artificial swarms, which I made in this manner, succeeded very well, because they happened to have their queen; but some that had not the queen deserted it very shortly to return to the parent hive, which caused a considerable agitation in the apiary. To remedy this evil, I confined the new swarms in the hive, giving them air, and this succeeded very well, when the queen was amongst them; but if she was not, the imprisoned Bees became so anxious to effect their liberty, that the majority perished.

When it is ascertained that the queen is not in the new hive, the most prompt measures should be adopted of procuring a queen, either from the parent hive, or from some other that has swarmed once; for it is in

the latter, that the supernumerary queens in general abound. Several methods have been devised by different apiarians for obtaining queens,* and as it is a most important and interesting part in the management of Bees, I shall investigate them fully.

The first method is when a hive swarms the second time, immediately that the swarm is seen to leave the hive, to run quickly to it, but you must in this case be an old warrior, and not fear a sting; place yourself almost in front of the hive, inclining rather to that side which is the most convenient, and observe the departure of the swarm with attention; it seldom happens that you will not see a queen depart, and sometimes several, who stop, and turn about for a certain time at the entrance of the hive. She may then be either caught with the fingers or imprisoned under a glass, and the object of your endeavours is then obtained.

In regard to this method, which originates with M. Ducarne, I can only say that I defy the boldest apiarian to approach a hive in the manner required by M. Ducarne at the moment of the departure of a swarm without covering his face with a mask and keeping up a vesuvian smoke about him; and whatever precaution he may adopt, he cannot prevent a number of Bees from perishing by fixing their stings in different parts of

* M. Contardi mentions a curious circumstance relative to obtaining queens. In Germany and France, he says it is the custom to preserve the queens to make use of them as occasion requires, and he adds, that in some parts of France a species of traffic is carried on with them by selling them at so much a head. He recommends the introduction of this method in all countries in which the culture of Bees is carried on. I grant that it would be a great advantage, could such a system be adopted, but I believe that it would not be possible to preserve a queen separated from the Bees, longer than two or three days.

his clothes. It appears also to me next to an impossibility, in this moment of confusion and disorder to notice a queen, much less to catch her.

The second method, is, if you are not skilful, nor fortunate enough to catch a queen at the time when the swarm leaves the hive, not to be discomfited, but to follow the swarm, and as soon as it has settled in a particular place, or rather began to settle, to examine with attention all the Bees which occupy the superficies of the cluster, and you will then perhaps observe a queen, which you can seize with your fingers.

The author of this method declares that it has almost always succeeded with him, and that it is very seldom, that by an attentive observation you do not perceive two or three queens walking about. He adds, that he once caught three queens in this manner, in one swarm.

I grant that this would be an excellent plan if during the settling of a swarm a queen could be distinguished. I have however great doubts of its feasibility, for I am persuaded that the queens are too confounded; too mixed with the Bees, and too much in the centre of the cluster, to render it possible to procure them in this manner. I am also persuaded, that although it may be easy to seize a queen, when she is walking on a swarm, yet it is impossible to take possession of her at the time when the swarm is settling, because at that particular juncture the Bees cluster so quick upon one another, as to render the queen not cognizable. Besides, a very serious question here arises, on taking a queen from a swarm, what certainty have you that there is another, and you may be ruining one hive to save

another. The queen, which is seen on the exterior of the swarm, may be the only one, and being incommoded with the heat, she may have forced her way to the outside, for the purpose of obtaining fresh air.

Another method is, to return the swarm to the parent hive, and place before the entrance of the hive, in which the swarm has been put, a tin plate pierced in such a manner, and of such dimensions, that a Bee only, and not the queen can pass through. This is taking it for granted, that the common Bees are smaller than the queen, which is denied by Wildman, and I am myself convinced that the passages must be cut to a truly mathematical nicety to prevent the egress of one and admit that of the other; but why, I repeat, should a queen be taken from one hive to form another; it is only the supernumerary queen, that ought to be taken, and this can only be effected by a full examination of the swarm, which must be either stupefied with smoke, or immersed in water until they are nearly dead, and then a queen can be obtained with great facility; in the case, however, of forming an artificial swarm from a hive in which there is a considerable quantity of brood, no danger can exist of giving the queen to the artificial swarm, as it is most likely that the Bees of the old hive will soon raise to themselves another queen from one of the eggs, or the probability is in favour of there being two or more queens at that particular season.

I have also observed, that the formation of an artificial swarm, does not prevent the same hive from throwing a natural swarm, and in this respect I consider artificial swarming to be prejudicial, as it is diverting nature from her usual track, and by impoverishing a

hive of its inhabitants, may be the means of losing it altogether.

I am, on the whole, thoroughly persuaded, that artificial swarming may please the amateur, but that it will never be generally adopted, nor will it tend to the ultimate advantage of the proprietor.

CHAP. XVI.

ON THE METHOD OF PREPARING HONEY AND WAX FOR THE MARKETS.

IF a large quantity of honey be gathered annually, a specific place should be appropriated for its manipulation, and its aspect should be invariably to the south. Having deposited the whole which has been collected from the Bees, the doors and windows should be closed, and even the chimney, that no access whatever may be granted to the Bees. Should some however, make their way into the apartment, they need not be feared, because on finding themselves imprisoned, they will attempt to free themselves by flying towards the window, which can be opened, and the Bees will immediately depart: precaution however becomes now doubly necessary, for it is certain that the Bees have a method of imparting to each other the discovery of any sweets to which they are attached, and it will soon be seen that the windows will be besieged with Bees eager to gain admittance.

When only a small quantity of honey is collected, it will be sufficient to have two, or three ea\then vesself with the same number of sieves of horse hair cloth, and also some vessels necessary for the reception of the honey, in which it is to be preserved. A

small press is indispensable, and some strong linen cloths, which are to contain the matter to be pressed, and finally some great buckets, or glazed earthen vessels with two handles, having a hole about half a inch from the bottom, through which the honey is to be poured as it flows from the combs, and which must be constantly kept closed with a cork.

To obtain the primary honey, heat, celerity and cleanliness are necessary. The honey should be extracted from the combs as soon as possible after being taken from the hive, so it will then flow better. The deprivation should take place on a fine day, merely for the purpose of the manipulation of the honey, and the operator should place himself in that position in the chamber, as that the rays of the sun may fall on the combs, from which the honey is to be extracted. Particular care must be taken to clear the combs of all dead Bees, and those cells which contain brood, or pollen must be cut out, as they will injure the quality of the honey. If the season be far advanced, a stove should be placed in the room, which will make the honey run more readily.

The sieves are now placed over the earthen vessels, and the combs are then cut into small pieces, but it must be observed, that they must always be cut in a horizontal manner, and it is better to slice them twice, that is, at the top and the bottom, than in the middle, as it is almost impossible to cut the combs so regularly through the middle, as that each cell shall be cut into: some persons crush the combs, but this is not advisable, as it is not possible to divest the combs wholly of the brood, and bee-bread, and the honey becomes thereby adulterated.

Some water should be kept in readiness to wash the hands of the operator, and the utensils, and the water should be preserved for a purpose which will be afterwards mentioned.

When a certain quantity of honey has flowed into the pans, it is then poured into the buckets, leaving the hole at the bottom: these buckets must be carefully covered: On the following day the honey may be poured into the vessels, in which it is to be preserved, or carried to market. In regard to the preservation of it, the method will be afterwards described.

The honey thus obtained, may be considered as the prime sort; a second inferior kind is procured in the following manner. If the combs from which the prime honey has been extracted are moist, and the weather warm, they should be kneaded a little, and if there be only a small quantity, they should be wrung in a clean cloth. If a large quantity, they should be pressed, for this purpose I generally use a piece of canvas of the strongest sort, fifteen or sixteen inches square; I pass a strong packthread in a semi-circle, on the edge of one side of the cloth, and another thread in a semi-circle on the opposite edge; I make a knot with the ends of the two threads, the cloth is set on a large glazed earthen platter, the combs are put into the middle of the cloth, and I squeeze them with my hands; I then draw on each side the ends of the threads, forming a kind of purse, which I close on tying the threads; this purse or bag is placed under the press, and the honey is squeezed out. I then place another bag on the first, a third, a fourth, and so on, leaving them afterwards to drop; after which I empty

the bags, and the wax is then drawn out in cakes which I lay apart to be melted.

If the weather be cold, I generally wait for a sunshiny day; I place my combs near a window, that the rays of the sun may soften them, or I place them in a lukewarm oven, or in the sun in vessels covered with glasses, and when the combs are soft and warm, I press them as has been already described.

On depositing this inferior honey in the vessels for preservation, the difference from the former will be very perceptible, as a scum will soon arise on the inferior sort, whilst the prime sort will be as pure as when it was placed in the vessels.

The utensils, cloths, and the other apparatus should be taken to the vicinity of the apiary, and the Bees will soon imbibe every particle of honey which may remain attached to them. This however, should be performed in the morning on a fine day, and the utensils, &c. should be removed about two or three, because, were they to remain all night, the Bees might wait so long until they were caught by the cold, and would consequently perish. No candied honey should be given them, nor vessels which have contained honey of any consistency, because the Bees in walking over this paste, daub their feet, which being then almost polished, can not cling to any thing; they indeed soon clean each other, but this honey bedaubs their whole body in such a manner, that they are covered with a kind of varnish, which proves their death.

In regard to the preservation of honey, it is in general spoiled by being placed in a damp situation. The chemists affirm that honey is deliquescent, that

is, that it imbibes the humidity of the air, or place in which it is deposited; that it dissolves, and whatever its consistency may have been, it becomes soft and sour. To remedy these inconveniences, the honey as soon as it is put into the preserving vessels, should be well corked down, and deposited in a dry place. Liquid honey should never be put into a vessel containing honey, which has taken any consistency; this mixture will make it ferment and turn sour.

In regard to the proportion of honey and wax, the Abbé della Rocca says, "that sixty pounds of honey comb yielded six or seven pounds of wax;" but I am convinced that this is an error, because the whole amount of wax which I once obtained from a hive of sixty pounds, was only two pounds of wax, and consequently 100 pounds of honey comb will only yield about three or four pounds of wax.

There is scarcely any article in commerce which is more adulterated than honey, and as it is generally sold by weight, it is mixed with heavy farinaceous substances, by which means honey is never obtained in its genuine purity.

There are two methods of discovering if honey has been adulterated with flour; the first is, to dilute a little honey with cold water, and if it be impregnated with flour, the water will become of a milky colour; the second is to place some honey in a pot, which pot must be half immersed in a saucepan of water; when the water is brought to a boiling heat, the honey becomes perfectly clarified, but if adulterated, a thick scum rises to the top, which on being taken off, and suffered to grow cold, crumbles into a fine farinaceous substance.

Honey is however, not equal in its quality, but the choice is as easy as it is important. That honey is best which is new, transparent, of a ropy consistency, of a sweet and agreeable smell, rather aromatic, and of a sweet and pungent taste. The white should always be preferred to that of a deeper colour; the new to the old; the honey of the spring to that of the summer, or the autumn, and that which when boiled, has a little froth, to that which has an abundance. The pungent sweetness is also to be preferred to the mere insipid sweetness; finally, the honey of a middling odour is preferable to that which has a strong one, as the latter is generally adulterated with certain strong herbs, which contribute much to give it those odours and qualities which render it more or less valuable.

The Greeks were, and the moderns are also of the opinion, that the use of honey conduces to the prolongation of life.* All medical men agree that honey taken internally is pectoral, that it assists respiration,

* In the Bibliotheque Economique for 1802, there is a recipe for an opiate, the use of which is announced as proper for persons exhausted with the infirmities of age. In the months of July and August, some kernels are collected before they have arrived at their perfect maturity, and the skin which envelopes them is taken off; they are then bruised in a mortar, until they are reduced to a paste; the best or prime honey is then taken, and equal quantities of the kernel paste, and the honey are mixed together; the whole being well incorporated, it is put into china pots, which are placed during summer in the cellar, in order to prevent fermentation; the heat having subsided, the pots are placed in a dry cupboard.

A spoonful is taken every morning on rising, and no food should be taken for two hours afterwards, because this conserve is in itself very nourishing. It strengthens exhausted nature, repairs and animates the strength. It must not however be taken in sickness, nor under an existing fever. It may be preserved for two or three years.

is a good digestive, and when applied externally is a dissolvent. It is used in many remedies, and in the Veterinary art it is found almost indispensable.*

* In 1802, some grafts of trees were sent from Italy to France, in a tin box filled with honey. They arrived in high preservation, and flourished well in the nursery of Luxemburg. This experiment may probably lead to others.

CHAP. XVII.

ON THE CAUSES OF THE MORTALITY OF BEES.

THERE are two kinds of mortality, which occasion the destruction of Bees; the one involuntary, which derives its causes independently of our will, and the other voluntary, occasioned by the proprietors obtaining possession of the honey and wax.

The principal cause which produces mortality, and consequently the destruction of the Bees, proceeds from a bad season, and especially when two or three come in succession; at that time the hives become very weak, and these poor insects are then exposed to all sorts of accidents; besides, when a hive is weakened to a certain point, it is soon attacked by the moths, which is one of the principal causes of the loss of Bees.

Many country people are persuaded that extreme cold and frosts occasion a great mortality among Bees, and I knew many persons who entertained a great fear for the lives of their Bees, during the severity of the winter of 1813, and some were even so infatuated as to wrap their hives up in old blankets, or any other warm substances which they could procure; the following

remarks, however, will shew the error of the system of keeping Bees warm in the winter.

In the travels of Gmelin in Siberia, in 1733, for the purpose of making observations on the different parts of the internal history of that country, the following intimation will be perused with particular interest by the advocates of preserving the Bees in a warm temperature. In the above travels, edited by Solnick, a physician who accompanied Gmelin, the following passage is to be found: "Although the city of Casan is more southerly than Petersburg, the cold is nevertheless more intense towards the end of December; the air appears as if frozen, and resembles a fog, although the weather at that time is the most clear and fine: this species of fog, or rather this condensation of air prevents the smoke from rising in the chimneys, and the humidity of the breath falls in rime on the chin. When a room is opened, a vapour is suddenly formed about the stove, and in the night the windows are covered with ice a quarter of an inch in thickness. Walking one fine day a few miles from the city of Casan, I had my face, my fingers, and my ears frozen, although I had not been half an hour on the road. I made use of the remedy generally recommended in such cases; I rub'd them with snow, and I was almost instantly cured."

"Notwithstanding the excessive cold, there is a great number of Bees kept in Siberia. On the road from Casan to Catherinæ Bourg, we found several trees, which were like so many hives of honey. The natives hollow the trunk of an aspin, willow, or lime, or any other soft wood to the length of five or six feet: at one of the sides they make an opening of ten or twelve

inches long, and four broad; they close the opening with a board fitted in a groove, and form some little holes for the ingress and egress of the Bees. They place these hives on the edges of the woods and suspend them to the trees by bands of rushes, in order to prevent the Bees from eating the honey, of which they are very voracious. The honey and wax which are obtained, form a considerable branch of the commerce of Casan."

The public journals having informed us that at the commencement of 1809 the cold rose in Russia to 36 degrees of the scale of Reaumur. I inquired of an amateur of Bees in that country, if after the intense colds which take place there, he had ever known the Bees or any other insects perish; he assured me that it never took place, and that in the summers which succeeded to the intense winters, there were as many Bees in Russia as after the milder winters.

In speaking of the commerce of the Russians, a Polish author tells us, "there is so much honey and wax found in the woods, that independently of the considerable quantity which the Russians employ for their wax tapers and their mead, they sell annually to strangers more than two thousand weight.

A third proof, that intense cold is not destructive to Bees, is extracted from the relation of the travels made in Lapland, by an officer appointed by the King of Sweden to accompany the French academicians despatched to the north to measure the most northern degree. "In these countries, in the vicinity of the pole, says this officer, there are three months of continual night in the winter; the cold is so intense, that spirits of wine freeze in the thermometer; when the door of

a warm room is opened, the exterior air converts the vapour immediately into snow. To observe the solitude in the cities, it might be supposed that the cold had killed all the inhabitants; it sometimes receives such sudden augmentations, that those who are unfortunately exposed to it, lose their arms, their legs, and sometimes their life. In the summer there are three months of continual day; and we are sometimes so annoyed *by Bees and flies of all sorts,* that we are obliged to burn green wood to occasion a deal of smoke, that they may be driven away."

I have met with many amateurs who pretend, that in the north the winters are too long, and the summers too short, to enable the natives to keep Bees: some travellers, however, attest their existence in the countries bordering on the pole. The summers indeed are short, but for the Bees they are almost as long as in our climate, because there is no night in the months of June and July, and they are, as has been already noticed, in a prodigious abundance, on account of the resinous trees which cover those countries.

In regard to our own climate, the following experiment has enabled me to ascertain the interior temperature of our hives, at the time of the greatest cold of the winter of 1813. Being desirous of ascertaining the degree of heat which preserves the Bees in our hives during the winter, I had some glass hives constructed, and in their interior, in the middle, I placed some wooden cases, of a diameter proportionate to the size of the thermometers, which it was my design they should enclose: these cases were studded with holes for the whole length. I introduced the

thermometer into the hives, at the middle of the upper part. I fixed my attention particularly on two hives; the one in the open air, and the other in a green-house; and, in order to have a point of comparison, I placed two other thermometers exterior to these hives, and in their proximity. Furnished with this apparatus, I visited my hives daily: I found, on the day of the greatest cold, the thermometer in the open air was twenty degrees below the freezing point, whilst that in the hive was twenty degrees above it, making a difference of forty degrees. In regard to the thermometers in the green-house, that which was exterior to the hive was twelve degrees below the freezing point, and that within, which on the preceding evening was twenty degrees above, had sunk to five degrees below. I became alarmed for the fate of these Bees; and, on examining the interior, I saw that the Bees had quitted the thermometer, and had retired to another part of the hive, where they were very lively. This incontestably proves two things; first, that the Bees, in a state of union, fear not the greatest colds of our climate; secondly, that they are not in a state of torpor during the frost, as has been asserted by some authors.*

I knew one apiarian who obstinately maintained that he had lost twelve hives by the cold during the

* I must not however take to myself the whole merit of this discovery: M. Huber says, p. 361, of his Observations, that the Bees are so free from torpor during the winter, that, when the thermometer falls in the open air to many degrees below the freezing point, it remains at twenty-four or twenty-five above it in those hives which are well peopled. The Bees *then* press closely towards each other, and thus, by mutual action, increase their natural heat. Dubost also mentions it in his *Methode avantageuse de gouverner les Abeilles.*

rigorous winter already mentioned; but I was so convinced that some other cause had co-operated in their destruction, that I requested permission to examine the hives. This was granted to me; and I soon discovered the real cause. It was true that the cold had been the virtual cause of the death of the Bees; but this cold had been able to operate upon the Bees by the negligence of the proprietor. His hives were in the most rotten and decayed state; the cold had the power of penetrating into all parts of the hive, and the Bees were therefore unable to preserve their natural heat.

The opinion of Keys, in regard to the effect of cold on Bees, is perfectly paradoxical: in the first place, he says, that the milder the winter and spring have been, the sooner their store is exhausted. This, without doubt, is true; and as it is certain that extreme cold has no injurious effect on Bees, it follows, that a cold winter is beneficial to them, as it preserves the food, and in weak hives this circumstance is of great importance. Mr. Keys, however, in the following page (164) says, the warmer the hives are kept the better. For what use, or of what benefit this warmth can be, I cannot conjecture, unless it disposes the Bees to eat more food, which is certainly no benefit, and warmth in itself is not of any particular advantage to the Bees in winter.

It is certain that more hives are destroyed by heat than by cold. The interior heat of a hive in summer, is commonly from twenty-seven to twenty-nine degrees of Reaumur, which is a warmth necessary for the prosperity of the brood. The Bees know, in some degree, in what manner to maintain it at this

point by the varied agitation of their wings on the organs of their respiration, which are underneath their wings. They can endure the heat to thirty or thirty-one degrees, but at thirty-two, and above that, they cannot support it. If the heat rises suddenly to thirty-two, the Bees take immediately to clustering on the outside of the hive, or a certain number leave the hive with a queen at their head. This forms the first swarm.

The greatest danger to be apprehended from heat, is the immediate influence of the sun on a hive, which the proprietor has incautiously, or ignorantly, left exposed. The rays, darting through the hives, soften the combs until they fall and crush, not only a number of common Bees, but the queen, and destroys also the brood. By these means the hive is wholly ruined. I once saw three fourths of the Bees of a swarm killed by the influence of the sun, in transporting them in a mahogany box, after the manner of Wildman, from the vicinity of London to Chislehurst, in Kent.

The best method to avert the influence of the sun, is to cover the hive with straw, in the manner of fig. 7. pl. IV. This material has also the advantage of not permitting the rain to penetrate, which is another cause of the mortality of the Bees, as it creates a humidity in the hive, which is very prejudicial to them. The humidity of our winters, added to that which exhales from the Bees, and retained by the temperature in the hive, are the cause of very serious injury happening to a hive. It renders the combs mouldy and musty, infects the Bees with the dysentery, or at least occasions a great deal of trouble to them

in gnawing away from their combs that part which is spoiled.

The inconvenience and danger resulting from humidity, may in a great degree be obviated, by placing the hives in a dry situation, facing the north. It is in the mild winters that the Bees suffer most from the humidity of the hive. During severe cold, the Bees being less vigorous, consume little, whereas, during a mild winter, they consume a great deal, and the hive being continually full of vapours, which exhale from the numerous population within, becomes at last a humid, unwholesome, and destructive habitation, unless the vapours are able to escape, and a renewal of air be effected. For this purpose I think it would be advisable not to plaster the hive to the board during the winter, by which a current of air would be produced. As to the greater admission of cold which would result from this plan, no fear whatever need be entertained; for the apiarian will always find it to his advantage to increase the coldness to his Bees rather than to mitigate it. To protect the Bees from humidity, some persons deposit the hives, during winter, in a dry and dark place; and it is alleged that another advantage accrues from the adoption of this plan, which is, that the Bees, being in total darkness, consume a less quantity of provision. I grant the truth of this position; but I would ask whether that advantage be not dearly purchased by the immediate disadvantage of the Bees not being able to take their flight during a sunshiny day, for the purpose of voiding their fæces? It is most certain that these periodical flights of the Bees tend very much to the preservation of their health, by maintaining cleanliness

in the hive, and preventing the consequent introduction into it of any infected air. I never yet saw the Bees of a hive, which had been confined during the whole winter, that were not in the spring, weak, sickly, and dispirited. Nature points out the necessity of the Bees taking their winter flights; and the prevention of them therefore must necessarily be attended with injurious consequences.

During the time however that snow is upon the ground, the Bees should be positively prohibited from leaving the hive, and the tin-wicket (fig. 8. pl. IV.) should be kept constantly down. Snow is a great cause of the mortality of Bees in the winter. Allured by the great reflexion of light, they issue from the hive at the first glimpse of a ray of the sun, and, settling upon the snow, are immediately chilled and die. During last winter I once visited the apiary of a friend, who had been so incautious as to omit confining his Bees during the snow. It was a fine, clear, sunshiny day, and the Bees, enticed by the transitory warmth, had left the hive to take their periodical flight. It was with the greatest mortification that I saw the ground literally studded with Bees, apparently dead and dying. I knew however that with the former it was but a suspension of life; and, collecting them all in a small basket, I hastened with them to the fire. In about twenty minutes, or half an hour, they were all recovered, and I had the satisfaction to see them fly back to their parent hive. It is however impossible to calculate the number of Bees which may have fallen on the snow beyond my line of observation; and also the number from other apiaries, in the neighbourhood, where a rooted and

deplorable prejudice in favour of ancient customs precludes the introduction of any new improvement.

The most determined cause of the mortality of the Bees has however yet to be mentioned, and that is, famine; and considering the facility with which that evil is averted, it is deplorable to observe the extent to which its ravages are carried. At the conclusion of the season, it is the duty of every apiarian to weigh his hives, and he may with safety be allowed to deprive them of all their honey exceeding twenty pounds. A well peopled hive will subsist during the winter on twelve or fourteen pounds of honey; but this is taken at the maximum, as the consumption in a hive depends in a great measure on the mildness, or coldness of the winter. M. Ducarne, who was a great advocate for the immuring of Bees during the winter in complete darkness, asserts, that by this method a well peopled hive will consume only two pounds of honey. I can give full credit to the truth of his assertion, in the same manner that I would to the asseveration of the physician, that a patient labouring under a high paroxysm of fever, or in a highly debilitated state, was very deficient in his appetite. In proportion to the health of the Bees, so will be the consumption of their food; and amongst the numerous apiarians and amateurs who have tried the system of excluding the Bees from all egress from the hive in winter, by confining them in a dark place, I never yet discovered one who declared that the Bees were in good health at the return of spring.*

* The Germans improving upon the system of confining the Bees during the winter, now adopt the practice of burying their hives. This is out-heroding Herod, and I am convinced that no apiarian will practise it a second time.

It is an undoubted fact that fewer hives die of hunger in the northern countries than in the southern: this, *prima facie*, may appear paradoxical; but it is grounded on the following observations:—In the north the extreme cold preserves the Bees in a state of inanimation, and prevents them from consuming their winter provender, which, on the return of spring, they find in great abundance, and thus escape the great evil of famine. On the contrary, in the southern climates, where the winters are mild, if by any untoward event a hive has not been able to collect a certain quantity of honey, the Bees, being in a state of constant liveliness, consume their provisions without thought, or economy, and the stock not being originally great, is exhausted before the return of spring.

To this argument an answer may be given,—that as in the milder climates the opportunities for the collection of honey are not only various, but also more lasting than in the northern, it might be supposed that there are few hives which are not provided with a sufficiency for the winter season. There are, however, certain casualties which will occur even in the most favourable climates, and a series of accidents may take place which baffle the skill of the most attentive apiarian. All these causes combined may prevent the collection of a sufficient quantity of honey for the winter season; and at the commencement of spring the apiarian is astonished to find himself deprived of many hives, on the profits of which he had depended during the ensuing summer.

On the subject of weighing the hive, particular attention should be paid whether it be an old one, or

new one. I have known many persons deceived in this respect, who, when they imagined that they had left a sufficiency for the maintenance of the Bees during the winter, were surprised to find on the return of spring that the Bees had been starved to death. This arises from the quantity of Bee-bread generally found in old hives, which, being of a very ponderous nature, deceives the proprietor in his calculations. The difference of three pounds at least should always be made between the weight of the honey to be left in an old hive, and that which is to be left in a new one: that is, that in an old hive about twenty-four pounds should be left, whereas twenty pounds* will be sufficient in a new one.

The danger of famine may at all times be averted by an early attention to the wants of the Bees, and an adequate supply of food. There is, therefore, no excuse for the proprietor who deplores the loss of his Bees by famine, as he had it in his power to save them with very little trouble and expense. The manner of feeding will be explained hereafter.

I would advise that a second weighing of the hives should take place about the middle of January. The state of the hive will then be exactly ascertained, and food administered to it if necessary. Let this operation however be done on a clear and brilliant day, with no snow on the ground, and about twelve o'clock

* Butler's remarks on this subject are very correct. He says, that no hope can be entertained of saving a hive through the winter which weighs only ten or twelve pounds. Those of fifteen pounds may be preserved by feeding; those from fifteen to twenty have need of very little food, whilst those of twenty pounds, and above, are free from all fear of famine *Butler's Feminine Monarchy*, quarto edit. 1623

in the day. Due caution ought also to be observed not to meddle with the hives during the time of frost; the motion will be apt to disunite the Bees; and not possessing sufficient vigour to form a reunion, they inevitably perish.

I have inquired of many persons, who deplored the loss of their hives during the winter of 1813, the particular state in which they found their hives after the loss of the Bees. The general answer was,—that they could not find any thing in the hive which could serve as nourishment to the Bees, and that they were found dead in the cells, and on the stand. Famine alone, then, and not cold produced their death. I offer this as a warning to all apiarians to attend to the feeding of their hives, and particularly the late swarms; they will be amply repaid for their trouble in the ensuing summer.

CHAP. XVIII.

ON THE LIFE OF THE BEE, AND THE PERIOD OF DURATION OF A HIVE.

THERE are two seasons which exhaust the hives of their inhabitants; the spring and the autumn. It may be calculated, with some degree of certainty, that more than a third of a hive dies in the autumn; and nearly the same number may be reckoned in the spring. The life of a Bee has been generally estimated at one year or two at the furthest. M. Reaumur was of this opinion, although the experiments which he made produced no positive confirmation.*

Notwithstanding the opinion of this able naturalist, I am inclined to believe that, barring the accidents

* M. l'Abbé Tessier, in the *Encyclopedie Methodique*, says, that the period of the life of a Bee is yet founded only on conjecture. One year may however be considered as the extent of it. In the month of April M. Reaumur marked five hundred Bees with a red dessiccative varnish; he observed them during the following months, but in November not one was to be seen.

The age of the Bee is estimated by the German apiarians NOne year; and they hold it as undoubted, that the queen of the present year is not to be found in the hive the following one. The age of the common Bee is estimated at one year or one and a half.

which frequently happen to Bees, and which occasion a violent death, they may live three, four, or even more years. I ground my opinion on the following principle:—If the queens, who lay annually a great number of eggs, live, as it is acknowledged by all naturalists, three or four years, the Bees, by a natural conclusion, ought to live as long; for it is an observation founded on general experience, that, in the natural economy of insects and animals, the female, who undergoes the pain and dangers of parturition, is shorter lived than the male. I can positively affirm, that the same queen has inhabited a hive for four years, and it is proved by the following circumstance:—In the spring of 1809 I had occasion to feed one of my hives, and in the evening when I took the plate from the hive, to my great mortification, I found the queen apparently dead, having been drowned in the liquid. I hastened with her to the house; and by the dint of as much attention as was ever bestowed by the most philanthropic member of the Humane Society in recovering a drowned man, I succeeded in restoring my valuable patient to life. The act however which I committed, during the syncope of the queen, might be followed with great advantage in certain countries, for I clipped the wings of royalty, and then with a slight mutilation, returned her to her longing subjects. This queen belonged to a strong second swarm of that year, and I clipped her wings for the purpose of ascertaining on the following year, whether the old queen, or a new one departed with the swarm. In the year 1810, after the swarm had departed from the hive, I drove the Bees from it, and I found my mutilated

queen still in the possession of her original kingdom. In the year 1813, I had occasion to unite a weak swarm to this hive, and in joining them I discovered my old mutilated friend again. This same hive was however, from some particular cause forsaken in the following year, and the fate of my quondam friend the queen, remains to this day a secret to me. I however, ascertained the fact, that a Queen Bee can live four years, and I draw the conclusion that a common Bee could live the same period, were it not exposed to particular dangers, exterior to the hive.

In regard to the duration of a hive, it is seldom in this country that it is permitted to exist during its natural term. The barbarous method of smoking the Bees is too prevalent in this country to admit of any positive data being given, on which to found an opinion of the longevity of a hive. Even with myself, and other apiarians, who do not murder the Bees, many circumstances combine to prevent any particular hive from being kept to a good old age. The various calamities to which Bees are subject, their maladies, and their enemies seldom allow of a hive being kept in the same apiary above five or six years, and indeed the very materials of which the hive itself is constructed, being highly perishable, and open to all the vicissitudes of the weather, is in itself, a great drawback to a protracted duration.

In the archipelago, where the hives are made of baked earth, it is very usual to observe hives of ten, fifteen and twenty years of age, and unless some bad seasons intervene, or that they were not wilfully destroyed for the honey and wax which they contain, it is supposed that they would last much longer: they

have been known in that country of the age of forty, or fifty years,—but this case is very rare. It must not however, be supposed, that in fixing the period of duration of a hive at fifteen or twenty years, it is meant thereby to infer that it is peopled with the same queen, or the same Bees during the whole of that time. A hive in this respect may be compared to a city,—the inhabitants who founded and built it are long since dead, but it still remains peopled by their descendants, and many perhaps have emigrated from it to form a colony elsewhere.

It is considered that the constantly increasing age of the combs, is one substantial reason for fixing the duration of a hive at the short period of a few years, as in proportion that the combs grow old, the Bees are more likely to be infected with a noxious air which is so prejudicial to them. The common straw hives which are kept as stocks, and the combs of which are never renewed, by not undergoing the process of deprivation, seldom last above three or four years, but on the other hand, in the hive of which I make use, I have the power in the course of three years, of renewing all the combs of the hive, and as it is certain that the Bees are in a constant state of renewal to fill up the chasms which are made in the population by various accidents and enemies, it is not an improbable case, that a hive may last fifteen or twenty years, provided the materials of which it is made will endure that period.

Lapoutre in his *Traité economique des Abeilles*, asserts, "that he saw a hive which was thirty years old." Du[illegible]t, in his *Culture des Abeilles*, says, "that he preserved a hive for twenty-eight years, and then

that it died by mere accident. In 1771, he had a hive twenty-one years old. Pequet of Noyou, preserved a hive for twenty-five years.—I do not however, mention these circumstances with a view to induce any person to keep a hive for such a length of time, without at times obliging the Bees to renew their combs.

One of the most injurious effects attendant on an old hive, is the facility with which the moth commits its ravages, and the observation of Wildman was most correct, when he says, that these little and apparently insignificant insects are more injurious to the Bees, than all their other enemies. In proportion as a hive decays, the moths find it more easy to penetrate through the chasms, and it must be allowed that the straw hives are particularly open to this inconvenience, unless certain measures are adopted to protect them from the influence of the weather. I therefore recommend that a strong coat of paint should be given to the exterior of the hive, and that in proportion as the interior is gradually deprived of the combs, it should also be well cleaned; this measure will protract the duration of the hive, by protecting it exteriorly from the influence of the weather, and interiorly from the ravages of the moth.

CHAP. XIX.

ON THE DEPRIVATION OF THE HIVES, AND WHETHER IT BE BETTER TO SUFFOCATE THEM, OR TO DEPRIVE THEM OF A PART OF THEIR HONEY AND WAX.

ONE of the most important, and serious questions which can be agitated relative to the management of Bees, and that which particularly merits the attention of the amateur, is, whether it be more advisable to suffocate annually the Bees of a certain number of hives, or to save their lives by depriving them of a part of their treasure.

The majority of the moderns are of the latter sentiment, and the ban of the humane apiarian, has been fulminated against all those who still adhere to the barbarous system of suffocation, and the epithet of public assassins has been bestowed upon them. It is in England, however, that the system of suffocation particularly exists, nor can any hope be entertained of a reform in this measure until the form of the hive be changed. The deprivation of honey from the common cottage hive, is an operation which few persons have the inclination or the courage to perform. The enthusiastic Bonner, attempted to establish the deprivation of the common hive in his native country, and performed the operation gratuitously, whenever he was required. By some people it was however, con-

sidered as a complete innovation of the general custom, and therefore that it should not be encouraged: others could not be convinced that their interest was concerned in saving the lives of the Bees, and the system of suffocation was resumed in all its pristine force.

As however there may be many persons who entertain a desire to be made acquainted with the process of deprivation, and probably to adopt it,—the following is the description. Having ascertained the weight of the hive, and consequently the quantity of honey-comb which is to be extracted, begin the operation as soon as evening sets in, by reverting the full hive, and placing an empty one over it; particular care must be taken that the two hives are of the same diameter, for if they differ in their dimensions, it will not be possible to effect the driving of the Bees. The hives being placed on each other, a sheet, or large table cloth must be tied round them at their point of junction, in order to prevent the Bees from molesting the operator. The hives being thus arranged, beat the sides gently with a stick or the hand, but particular caution must be used to beat it on those parts to which the combs are attached, and which will be found parallel with the entrance of the hive. The ascent of the Bees into the upper hive will be known by a loud humming noise, indicative of the pleasure in finding an asylum from their enemy; in a few minutes the whole community will have ascended, and the hive with the Bees in it may be placed upon the pedestal, from which the full hive was removed. The hive from which the Bees have been driven must then be taken into the house, and the operation commences of

cutting out the honey-comb. A few Bees will be found still straggling about the combs, but no attention need be paid to them, for it is certain that the queen is amongst the Bees left in the hive in the apiary, and fear is too much impressed upon them to excite their propensity to make use of their sting. Having extracted the requisite quantity of comb, this opportunity must be embraced of inspecting the hive, and of cleaning it from any obnoxious matter. In cutting the combs however, particular attention should be paid not to cut into two, or three combs at once, but having commenced the cutting of one, to pursue it to the top of the hive, and this caution is necessary, for two reasons. If you begin the cutting of two or three combs at one time, were you to extract the whole of them, you would perhaps take too much, and secondly, to stop in the middle of a comb, would be attended with very pernicious consequences, as the honey would drop from the cells which have been cut into, and then the Bees on being returned to their native hive might be drowned in their own sweets. The Bees also in their return to their natural domicile, being still under the impression of fear, would not give that attention to the honey which flows from the divided cells, and as it would fall on the board, and from that on the ground, the Bees belonging to the other hives, would immediately scent the wasted treasure, and a general attack upon the deprivated hive might be dreaded. The deprivation of the honey-comb being effected, the hive may be returned to its former position, and reversing the hive which contains the Bees, and placing the deprivated hive over it, they may be left in that situation till the

morning, when the Bees will be found to have taken possession of their native hive.

In regard to the time of the year in which this operation is to be performed, various opinions exist,—some maintain that it ought not to be performed until the end of the season, that is, in October, whilst others are of opinion, that it should take place immediately after the swarming season. I am an advocate for the latter period, and it is founded on this principle, that the Bees from the month of August to October, may replenish the vacuum in the hive occasioned by the deprivation, which cannot fail being of essential benefit to the Bees; but were the operation to be performed in October, the chasm would remain till the spring, and the quantity of humid air in the hive would be greatly increased.

In the hive which I use, the deprivation is effected with peculiar facility and neatness, the driving of the Bees, by which a number are unavoidably killed, is not required, and the comb is taken out in its full and perfect length.

It is curious to trace the system and opinions not only of the ancient but of the moderns, on this interesting topic. Cato, the Censor, who wrote on rural matters, and who died one hundred and forty-eight years before Christ, makes no mention whatever of Bees; although we find from earlier documents, and even the sacred writings, that honey was well known.

Varro, who wrote on the same subject one hundred and twenty-three years after Cato, is the first whose writings make mention of Bees; and what is particularly interesting on this point, he informs us of the

manner in which honey was collected in his times. He mentions two methods of proceeding; the first is by changing the Bees from one hive to another, and the second by deprivation.*

He is however silent in regard to the detail of these operations: he merely makes mention of some precautions which it is necessary to take on those occasions, viz.—the hive into which the Bees are removed, should be rubbed with balm, because the odour attracts them, and some pieces of comb should be placed within, near the entrance, which will prevent the Bees from regretting their departure from their native domicile.

In regard to the deprivation, he gives it as his opinion, that nine-tenths of the honey may be extracted: in this opinion he is in a manifest error. The produce however from these methods was probably not great; for in his time honey was very scarce: it was only made use of in the sacrifices, or at the tables of the great, in the first and second courses.

Columella, who lived in the forty-third year of the Christian era, makes no mention of the change of Bees from one hive to another, but merely of the deprivation, on which he descants with greater prolixity than Varro. But it must be confessed, that his sentiments on this subject are very obscure to the reader, who reflects on the difficulties and inconveniences which result from the operations which he proposes.

These two authors are however wholly silent on the method of destroying the bees to obtain their honey, which is a proof that it was not in vogue in their time,

* Varr. lib. cap. 4

or they would have either recommended or condemned it.

The method therefore of removing the bees from one hive into another, appears to have been first invented for the purpose of obtaining the honey; for, in regard to the wax, it was regarded in former times as an object of little value, but which still was not to be neglected. But the great inconvenience to which this manner of collecting the honey is subject, is that which Varro particularly mentions, in giving an opportunity to the bees to forsake the new hive, which cannot be remedied but by using the precautions of which I have already spoken, and it was this very inconvenience which first suggested the idea of deprivation. In order to effect this purpose Columella invented the hive which opens on the back, and at the top.

The second method not answering the expectation of certain proprietors owing to the paucity of the produce, the last resource was tried, which was massacring the Bees to obtain their honey.

As habits, whether they be good or bad, which have been once adopted, have always partisans who perpetuate them from generation to generation, these three methods of gathering the honey have subsisted to the present day. They who adopt the two former are probably inclined to them from compassion to these charming insects, to whom they are willing to sacrifice their own interests; but those who adopt the latter, practise it, most certainly, as the surest means of obtaining the greatest quantity of honey and wax.

The method of collecting the honey by suffocating the Bees, is adopted in most countries, but particu-

larly in England, France, and Italy. Ranconi, in his Dictionary on Italian Agriculture says that the suffocation of Bees is a most abusive practice, as it tends to destroy this species of insects, so interesting by their ingenious industry.

Contardi, in his thirty-second note, also says that the cause of the number of hives in his country being so very small, arises from the custom of killing the Bees. Among the French apiarians one very able and skilful one has appeared, M. La Grenée, who is a strenuous advocate for the suffocation of the Bees, and his arguments carry with them such validity, that I shall think myself exonerated from the charge of prolixity, if I give his opinion in full, and the discussion of it cannot but be interesting to apiarians, as it forms the basis of the economy of the Bees, and on which the excellence of their government depends.

"Let not any person suppose," says M. La Grenée, "that in adopting the method of suffocating the Bees, I am prejudiced against the reasons which have been advanced to induce me to relinquish it.—No, I have scrupulously perused all the writings on the subject. I have weighed them most attentively: I have not only studied their theory, but practised the different methods which have been laid down; but neither books nor experiments have been able to convince me that there is a more preferable method than that which I use, which is by suffocation.

"The following are the grounds on which I found my opinion. What is the question between those who argue on the point? It is to procure for the country an abundance of honey and wax, which did not previously exist, and to the proprietor of the Bees, an ac-

tual profit and a sufficiency to enable him to bestow the necessary attention, and costs on the maintenance of his apiary.

"To succeed in these two points, it was supposed that it was only required to persuade those who keep Bees, never to kill them, and to content themselves with moving them from one hive to another, or to partake of their stock by the method of deprivation.

"But as it has been proved that it is neither easy, nor useful to adopt either of those two methods, it is inconceivable the efforts that have been made for some years past to discover the means proper for the collecting of honey and wax, without killing the Bees.

"I therefore proceed to shew, as briefly as possible, that those authors commit a great error, in hoping by the plans which they have invented, of satisfying equally the public by abundance, and the individual by a reasonable profit.

"When the Bees are removed from one hive to another, it should be performed two or three days after the departure of the first swarm, in order that they may have time to collect a sufficiency of food in their new domicile. But what quantity of honey would be found under those circumstances, even in the strongest hives?—ten or twelve pounds,—and perhaps less.—Can it be compared with that which would have been found at the end of August, or the beginning of September, when the provision is collected for the winter, which amounts to thirty, forty, fifty, and sometimes even eighty pounds?"

"If the answer be given that the Bees have been preserved, I would concede the point, provided the operation had succeeded (for it must not be dissimulated

that it often fails, and that generally, of ten hives, which have been removed, eight or nine perish) but it must also be granted to me, that a second swarm has consequently been lost, which was on the eve of its departure, and perhaps the brood of a third, and that these two swarms united, would certainly have made a better one than that which is formed by the Bees which have been removed. But let us calculate the produce of this method with that which is produced by the system of suffocation. We will suppose that a proprietor has ten hives: according to the removing system, they will furnish each twelve pounds of honey, which amount in the whole to 120 pounds, and the proprietor will possess twenty hives, ten old, and ten new ones. The sixty pounds of honey may be valued at £9. and £20. for the twenty hives."

"According to the suffocating system, ten hives will produce thirty pounds of honey each, which amount to 300, and the proprietor will have twelve young hives, that is, ten composed of the first swarms, and two of the second and third, or in other words, the honey will amount to £22. 10*s*. and the hives to £12. In order to facilitate the calculation, I suppose that each hive gives but one swarm in the year."

"Although these two species of profit, as well in honey, as in hives, appear to the two proprietors to amount to nearly the same sum in money, a considerable difference is still to be remarked; for in the first case, the public profit only by 120 pounds of honey for their consumption, and the proprietor has realized only £9. in money; whereas in the second, the public are put in possession of 300 pounds of honey, and the proprietor has realized £22. 10s. in money."

"It must not either be supposed that in the following years the benefit of the first proprietor will far exceed that of the second, by the greater multiplication of his hives; this would be tantamount to a voluntary concealment of the frequent, and almost general mortality occasioned by the method of removing the Bees from one hive to another, and which will indubitably reduce every year the great number of hives of the first proprietor, to a number below that remaining to the second, by which we may be assured, that the annual profits of the former, so far from being more considerable than those of the latter, will always be much smaller."

"This method therefore of removing the Bees into other hives, after the departure of the first swarm, is neither advantageous for the proprietor nor the public; and I will now examine if those who are contented with the mere deprivation of the hives meet with better success."

"There are two sort of hives in which this operation is performed; first, in those which are constructed of a bell shape, which are in general use in England, Scotland, and some parts of France, (Plate III. No. 6.) and secondly, in those which are made of wood. These hives are of a new invention, composed of several smaller hives or stories, without a general bottom, but with the bottoms of the stories perforated, that a communication may be obtained from one to the other. It is a well-known fact, that the Bees always commence their operations by filling the upper story, in which they have been immediately placed, and that they afterwards descend into the lower one to continue their labours. When the deprivation takes

vice, one or two of the upper stories, when they are full, are removed by cutting the communication with a wire, in the same manner as butter is cut in a firkin. The remaining story is then closed at the top, by which the produce of the Bees is easily extracted from them, without their perceiving it."

"In regard to the common or bell-shaped hive, every body knows that the principal part of the honey being placed at the top, the sticks which are absolutely necessary to support the combs, are an insurmountable obstacle to the extraction of the combs in a neat, and profitable manner. This objection may be obviated by saying, that these sticks can be extracted by pincers, and the hive can then be managed according to pleasure; it however most frequently happens, that these transverse sticks cannot be extracted without great injury to the combs; and what person does not perceive that this operation must place the Bees in a terrible state of agitation, and be the death of thousands; one-half would perish by the stings, which they would bestow with profusion on their tormentors in spite of fumigation, and the remainder by the honey, which would stifle them. I have always experienced very great trouble in extracting the honey-comb from a hive, the Bees of which have been smothered, for the sole reason that the cross sticks could not be drawn out.*"

"In regard to those hives composed of stories, I allow that the deprivation of the honey is performed much more easily than in others. But is the proprietor

* Mr. La Grenée appears in this instance to be wholly ignorant of the system of driving the Bees, by which the operation can be performed without the destruction of a great number of Bees; but in regard to the obstacle which the cross sticks present towards a useful, and advan-

always regardful of the important circumstance, extract only that particular quantity from the hives, which will prevent the danger of famine? For if the stories be small, and if, from a fear of injuring the Bees, he extracts but a small portion of their produce, wherein then does his advantage consist? On the other hand, if the upper stories be large, they contain perhaps the whole of the honey, and in taking them away, the Bees are consequently deprived of their winter food, and must inevitably perish."

"If, to avert this evil, the system of feeding be resorted to, the proprietor will be under the necessity of returning to the Bees the honey which he took from them, and if the Bees escaped from a death of famine, they would inevitably perish by the pillage, which is frequently and almost universally occasioned by these artificial supplies of food."

"I am well aware that authors in general pretend to prescribe a remedy for all these evils; they accumulate rules upon rules, whether it be respecting the time of depriving the strong hives, (on which by the bye scarcely two persons agree) or the manner of feeding the weak ones; and finally, they recommend strong barricadoes to be placed at the entrance of the hives, to protect them from pillage. But in what manner is the mind of the peasant to be instructed in this code of laws, which even to an attentive and reflecting mind, presents matter of very serious, and difficult consideration?"

tageous deprivation of the comb, his remarks are perfectly consistent with my own experience; and I am certain that the system of deprivation never can be general in this country whilst the hive of the bell-shape is in use".

I have now detailed the processes which have been imagined for depriving the Bees easily of their provisions without killing them. It is evident that these different methods do not obviate the two principal inconveniences, which are so conspicuous; one of which is the entire loss of the hives during the winter, if a great quantity of provision be extracted from them; and the other is the paucity of supply to the public, and almost no profit whatever to the proprietor, if only a little be taken."

I will now briefly examine this important part of the economy of the Bees, and I am constrained to say, that if humanity be taken out of the scale, the ideas of M. La Grenée are founded on truth, and demonstration. In reasoning analogically, humanity ought to plead in the same manner for the ox which has drawn the plough, or the cow which has furnished us with her milk. On their arriving at that age, when they are no longer of any use to man, they are fattened, and killed for his nutriment. The only objection to this mode of reasoning may be, that the produce of the Bee may be considered a superfluity, and a luxury; the produce of the animals above mentioned, is actually necessary to the subsistence of man.

The destruction of Bees, voluntary or forced, contributes more than any other circumstance, to reduce the culture of those insects to a state of languor very opposite to that degree of perfection of which it is susceptible in this country. But as M. La Grenée observes in another part of his work, of what use to the proprietor and the public are so many researches and experiments to extract the honey and the wax without destroying the Bees, if, notwithstanding all

these precautions, a proportion of the hives which have been deprived, die soon after the operation; and if the other proportion, having escaped the immediate danger of the former, die during the winter for want of provisions.

I have already mentioned the destruction which takes place in hives from a default of provisions, and from which no portion whatever has been extracted by the proprietor; how much greater then must it be in those hives which have undergone deprivation, and from which a moiety of their provisions has been taken! and the population of which, not having suffered by the deprivation, ought to be supposed equal to that of the hives which have remained untouched?

It is not therefore by a mere shew and affectation of compassion for the Bees, that the system of M. La Grenée must be combated. There must be opposed to it solid and indubitable facts, founded on a sound practice, and exempt from those inconveniences and abuses which he censures with so much asperity, as existing in the systems invented by the moderns, and adopted by them to obtain possession of the produce of the Bees without killing them.

M. La Grenée asks, what is the question between those who argue on this point? I answer, that it consists, in the first place, in finding a sure and certain method of multiplying the Bees and the number of their cultivators: secondly, in supplying the kingdom with that abundance of honey and wax, of which it is capable, owing to its favorable situation: and thirdly, in rendering the culture of the Bees positively advantageous to the state, and the proprietors: this is the

vish of the public, and it ought to be the aim of the labours of every author. These three objects are so closely united one to the other, that they cannot be separated.

In regard to the multiplication of the species, it is evident that its voluntary or forced destruction is wholly inimical to it. If this be added to the bad management of the bees, we shall find the principal cause which presents itself to their more extended culture, and in providing no remedy for it, the country will always be deficient in the necessary quantity of honey and wax.

The method of depriving the hives, without killing Bees, is therefore preferable to that of killing them to obtain their honey. This truth will be more sensibly perceived, if we reflect that there is not in England a sufficient number of cultivators and proprietors, to introduce into the country that desired abundance nor that number of hives which every cultivator could support according to his faculties. But this point being once accomplished, the supernumerary hives might then be destroyed, and it is under those circumstances, and those only, that it should be permitted.

To this position, M. La Grenée would answer, that this system would be good, if the deprivated hives could be preserved in a good situation, and escape the keenness and the length of the winters, as no doubt can be entertained that, by adding the new swarms which they would furnish every year, an abundance of honey and wax would be produced; but as it has been ascertained that during, or after the deprivation, a great part of the Bees perish, and al-

most always in the winter, it is clear that this method of collecting honey is prejudicial to the Bees, and disadvantageous to the proprietors.

To this I rejoin, that the manner in which my hives are deprived of their honey, is so easy and expeditious, that it very seldom happens that a hive is lost from mere deprivation. During 16 years I have never lost a single hive, though I acknowledge I have lost many when my Bees were kept in the common or bell-shaped hive.

In regard to the hives which perish in the winter, this happens not only to the deprivated hives, but also to those which are not, and it becomes therefore absolutely necessary to provide some means by which no failure of provisions should take place, let the consumption of the Bees in winter be ever so great.

I have now merely to notice the calculation of M. La Grenée, on the difference of profit accruing to two different proprietors following the opposite methods. I will suppose that he has extracted from one of his hives forty pounds of honey, whilst I have only obtained fifteen. If I manage my hive well, and that I preserve it for ten years, it will yield me the same quantity every year. Moreover, the hive destroyed by M. La Grenée will only have yielded him one swarm, whereas that which I have preserved for ten years will have produced me at least ten, without speaking of those which those ten may have produced. Let me now ask which of the two will have received the greatest profit from his hive at the end of ten years? whether M. La Grenée, who destroyed his hive, after having obtained forty pounds of honey and one swarm, or myself, who, after having preserved

my hive for ten years, have obtained, independently of one hundred pounds of honey, ten swarms, and also the produce of those ten swarms. Who has contributed the most to supply the country with honey and wax? Let M. La Grenée judge for himself.

CHAP. XX.

ON THE MANNER OF FEEDING BEES.

THERE are two seasons in which the feeding of Bees is necessary, and these are the winter and the spring. At the commencement of the former season, particular attention should be paid to those hives which are supposed to be deficient in food; and having examined, and found them light, an immediate supply of food should be given them. It is a question which has been much agitated amongst apiarians, whether the whole quantity should be given to the Bees at one time, which is supposed to suffice them until the return of spring, or whether it should be given at intervals. I am myself a decided advocate for the latter method, and my opinion is founded on the following grounds: It is certain that whatever quantity of food is given to the Bees, they never relax in their exertions to convey it to their combs, until every drop be exhausted. If the season be very cold in which the food is given, the temperature in the hive, which is congenial to the health of the Bees, is lost by the time which the bees must necessarily remain in a state of disjunction, and the whole community then becomes in danger of perishing.

Although it very seldom happens that honey candies in the cell; yet it is very often the case with artificial food and especially from the manner in which it is given to the Bees by the country people. The candying of the food in the cells is very prejudicial to the Bees; for in the first place it is wholly useless to them, and in the second, the removal of it from the cells occupies a great portion of the time of the Bees in the spring, when they could be more profitably employed. If the food be given in small quantities, this inconvenience is wholly obviated, as it has not time to candy in the cells before it is consumed by the Bees.

There is also great danger in giving to a weak hive a great quantity of food at once, unless the hive be very rich in combs; and which is seldom the case, unless the swarm has been put into a hive already filled with them. The Bees are so greedy of food, that if a great quantity be given, they will even fill the brood combs, rather than relinquish the treasure, and on the return of spring the brood cells will then be found full of food, which ought to be in readiness for the eggs of the queen. I have even known the eggs of the present year, and which are to hatch in the ensuing spring, wholly destroyed by an injudicious and lavish method of feeding; for the Bees appear to have such an intuitive fear of hunger, that every other consideration vanishes before it.

The apiarian has it also in his power to select a fine and warm day for the purpose of feeding his Bees, and the danger of the change of temperature in the hive will then be obviated.

If the Bees seem anxious for the transportation of

the food into the cells, and if they display a certain degree of irascibility, it is then certain that they are in good health, and there is no fear of them abandoning their hive; but it sometimes happens, that when food is given to the Bees, they shew a total indifference towards it; and although it may be allowed to remain several days, not a single Bee attempts to deposit a drop in the cells. This circumstance should act as a warning voice to the proprietor, and he should immediately inspect his hive most narrowly; for he may depend that there is something radically defective in it. Some accident has perhaps befallen the queen, or some other cause exists which renders them indifferent to their food, from a consciousness perhaps, that they will not require it. Every exertion should be used by the proprietor to discover the cause of this indifference; for unless it be discovered, he may depend upon his hive being forsaken by the Bees in a very short time; should the proprietor not succeed in discovering the defect, I would advise him to join the Bees to one of his strongest hives; this is better than losing them altogether.

In regard to the quantity of food which ought to be given to a hive, it may be calculated in the proportion of two pounds per month for a well peopled hive, but no particular rule can be laid down in this respect, as the consumption of the Bees depends in a great measure on the state of the weather. If the weather be excessively cold, a much less quantity will suffice; nor would it be at all advisable to feed them during the inclemency of the season, but to wait for a change in the exterior temperature of the air. I scarcely ever fed a hive, that the Bees did not sally forth, tes-

tifying their joy at the bounty of their owner, and should the weather be fine, I always permit it; but should it be mild with rain, I invariably close the entrance of the hive until the evening.

When a hive is fed in the spring, the greatest caution should be used to prevent the robberies committed by the Bees of the other hives. The food in this case should be given very early in the morning, before a single Bee has left the hive, and as soon as the food is administered, the entrance ought to be immediately stopped. Unless however the operation be performed before break of day, the most disastrous consequences may ensue; for in this season the Bees are all on the alert, and leave the hive in great numbers with the first ray of the sun. If therefore you have fed your Bees, and closed the entrance of the hive, you will consequently lose those Bees which may have departed early on their daily labour, as the hive must not be re-opened to admit them.

This precaution of closing the entrance of the hive is so essential, that were it to be neglected, not only the honey but the whole hive would be lost. An instantaneous robbery would commence, as the stronger Bees would smell the food, and should the hive to which the food is applied be a weak one, it will not be able to resist the attack of the robbers, and its destruction will be the consequence.

The most prudent and safe method is to administer the food after sunset, when the precaution of closing the entrance need not be resorted to; but care must be taken to remove the vessel which contained the food, before the Bees are in motion on the following morning.

There are some persons who defer the feeding of their Bees, until the very moment when they suppose that they may be in actual want. This is a most reprehensible plan; for should the feeding be too long delayed, the Bees will become so weak and debilitated, that they will be unable to convey the food into their cells. The food ought to be administered to them full three weeks before they may be supposed to be in actual want: it will then be conveyed with the greatest despatch into the cells, and the hive will be saved from a death of famine.

Some apiarians conceive that the feeding of Bees in the spring renders them lazy and inactive. On what this opinion is grounded, I am at a loss to conceive; for it is in direct contradiction, not only to my own experience, but also to that of many other apiarians. I consider that a little food granted to even a very populous and well provisioned hive in the spring, is attended with very beneficial consequences. It bestows life, animation, and vigour, throughout the whole community; it accelerates the breeding of the queen, and consequently conduces to the production of early swarms. I invariably give all my hives some food in the spring, and I can recommend the custom with the greatest certainty of its propriety to every keeper of Bees.

In regard to the substances, which are proper for the feeding of Bees, I am perfectly convinced, singular as it may appear, that honey alone is very injurious to them, as it in general gives them the dysentery. Wherever honey is given, it should be mixed with some good old wine, in the proportion of six pounds of honey to one of wine. It should then be placed on

a slow fire, and stirred round with a stick, or spoon, until the honey be wholly dissolved, and appears in a transparent and limpid state. It should be then taken from the fire, and when cold, poured into a jar or other vessel to be used as occasion may require.

The following is a mixture which I have found very conducive to the health and strength of the Bees. Take eight pounds of honey, six pounds of water, one bottle of old wine, and one pound of sugar; put them all into a saucepan, and let them boil for about a quarter of an hour, skimming it repeatedly. Take it off the fire and let it cool gradually, it may then be put into bottles, and kept for use. The most advisable method however is, not to make more than what is immediately wanted, as there is some danger of it fermenting.

This method of feeding is however too expensive for the cottager, and from repeated experience, I am persuaded that the following mixture is as appropriate and beneficial to the Bees as that which has been already described, and its cost comparatively very small. To two quarts of good old ale, put one pound of moist sugar. Boil them until the sugar is wholly dissolved, carefully skimming it. When it is cold, it will be found to be of the consistency of honey, and it may be given to the Bees in the following manner: If the Bees are in the plain cottage hive, an eek must be provided of the same diameter as the hive, and from three to four bands in height. When the sun is set, and the Bees are all returned from the fields, let the hive be gently raised, and the eek placed on the stool. Then having filled a soup plate with the food, place it in the eek, and replace the hive upon it. To prevent the Bees from be-

ing drowned in the liquid, it is necessary to place some straws over the plate, and over the straws a piece of paper, either thickly perforated or cut into nicks. These nicks however, must not run parallel with the straws, but either across or diagonally. The entrance must then be closed, and the plate may be removed on the following morning, when the whole of the liquid will be transferred into the combs. I have known the Bees so very greedy after this food, as to eat the paper which is in the least saturated with it, and in general the edges of it will be found nibbled with their teeth.

If the hive be very weak, the feeding should be repeated in about three weeks or a month, but if it takes place in winter the mildest weather should be selected for the purpose, the reason of which has been already given.

A farmer in Hampshire once informed me, that he considered the feeding of Bees as wholly useless, for he had often tried it, and his Bees nevertheless died. On inquiring the manner in which he fed them, he answered that he adopted the same method as his neighbours, which was, to put a handful of sugar on the stool, and pouring a little water on it to moisten it, it was left in that state for the Bees to take into their combs. My surprise was not great at the death of the Bees, for although they will certainly convey the sugar into the combs, yet, as it has not undergone the process of concoction, it invariably candies in the cells, and then becomes rather injurious than beneficial to the Bees. I imparted a different system to the worthy farmer, who happened to possess too much sense to be led away by ill founded prejudices, and he not only adopt-

ed my method, but it is now become general in that part of the country.

I have always found it very conducive to the health of the Bees to put a little salt in their food, especially in those cases in which there is the slightest fear of the dysentery.

Mr. Ducouedic recommends that a little flower should be mixed with the food, and I have known some old women practise this method in England, from an idea of giving a greater consistency to the liquid. Let me however warn any proprietor of Bees, from adopting this most injurious method. The admixture of any farinaceous substance acts as a laxative upon the Bees, and instead of invigorating, weakens and debilitates them.

It has been suggested by some apiarians that the whole of the food intended to be given to a hive, should be given to it in the month of October, or early in November; and the reason assigned for this system is, that the weather may be so cold in the ensuing month as to render it dangerous to disunite the Bees by giving them any food, and that in their endeavours to transport the food into the cells, they might be seized with the cold and perish. This argument can, however, only be supported by those, who suppose, that the Bees have any occasion for food in the intensity of winter, which supposition is contrary to general experience. If the Bees do not consume any provisions, when rendered torpid by the cold, where would be the necessity of administering any food to them, the transportation of which into their combs would prove their death, and of which, the severity of the season will not allow them to make any use? I am always per-

fectly easy in regard to the fate of my Bees, during the intensity of frost, so far as relates to the state of their food, for as they consume but little, or none, it would be an act of supererogation to give them any, especially as the lives of the Bees are thereby put into great jeopardy. It is only in the mild winters that I pay particular attention to the state of the food in my hives, and then no danger can be apprehended in admitting the exterior air into the hive; on the contrary, I consider it wholly beneficial to the Bees, as the foul air which has been generated in the hive is thereby dispersed, and fresh air introduced.

In a weakly peopled hive, it will sometimes occur, that intense frost will candy the honey in the combs, and the Bees being thus deprived of their natural food, die for want. This circumstance is, however, scarcely known to happen even in the more northern climates of Norway, Sweden and Russia, nor can I say, that it ever befell one of my hives, although Bonner assures me that he has experienced it. Various calculations have been made by very able naturalists, of the supposed quantity of honey which a hive consumes in a day, and thence the conclusion can be drawn of the quantity requisite for their support during the winter. The data, however, on which that calculation has been made, must depend on such various, and particular circumstances, that scarcely two can be found which have a perfect correspondence and coincidence. In the first place, it is almost impossible to ascertain the exact number of the Bees, and as two hives cannot be found to correspond exactly in number, the same calculation will not be admissible for both. In the second place, the consumption in a hive is always in proportion to the

mildness, or severity of the season, and therefore no regular rule can be established by which the consumption of a hive can be ascertained. In the Philosophical Transactions for 1792, is a calculation made by Hunter, of the consumption of a hive, and he estimates that from the 3d October to the 9th February the Bees consumed within one ounce of four pounds. The hive was however not a very populous one, and he therefore concludes that a well peopled hive will consume about five pounds during the five months of the winter season. A weak hive generally contains about three pounds of honey, and it is therefore to be concluded, that, if three pounds of food be given to it, it will survive the winter. In 1809, M. Huber made the experiment with this quantity on five hives, and he succeeded in saving them all.*

Should the cottager not be able to afford even sugar, treacle will be found an excellent substitute; let it be diluted in the proportion of one-third of molasses to two-thirds of water, and mixing a little salt with it, boil it for about a quarter of an hour; the same process must then be followed as has been already described.

* Lett. Jed. de M. Huber, du 15 Avril, 1810.

CHAP. XXI.

ON THE RE-ESTABLISHMENT OF HIVES, THE BEES OF WHICH HAVE PERISHED BY ACCIDENT OR WANT.

WHEN Mr. Reaumur gave his explanation of a swarm, he was not far removed from the discovery of the re-establishment of a hive, the Bees of which have perished by accident or want. A very simple reflection on the existence of the eggs of the Queen in the hive, and on the promptitude with which those eggs are hatched on the return of the warm season, would have infallibly led to the discovery of this phenomenon. The greatest discoveries in the mysteries, and the caprices of nature, have almost always sprung more from the wanton frolics of chance, than from the close meditations of the naturalist.

It is the general custom when a hive of Bees has perished in the spring, either from a want of subsistence, the intemperature of the season, or the robbery of other Bees, to empty the hive of the combs, and to convert them into wax. This, however, is a very unprofitable plan, for, from my extensive experience, I have ascertained that a much more advantageous use can be made of those hives, which have perished during the winter, and which appears hitherto to have escaped the vigilance of the most celebrated apiarians.

There is no doubt that, in the cells of the combs which are melted for the purpose of obtaining the wax, there are many eggs, the vital principle of which has not perished with the inhabitants of the hive; these eggs are almost imperceptible, attached to the bottom of the cells, exactly as the Queen Bee deposited them. These eggs can only hatch on the return of the warm season, and they are consequently hatched, if the combs, which contained them, are preserved, because it is the order and routine of nature.

These eggs may be considered in the first place as the brood remaining in the state of fecundated eggs, at the time of the destruction of the drones of the preceding year, and which ought to compose, on the return of the fine season, the first swarm of the hive, if it had survived the winter.

In the second place, they may be considered as the brood of the current year, which the queen has deposited in the cells since the destruction of the drones, during the autumn, or the last month of the winter, or the first of the spring, and which can only be fecundated by the drones of the first swarm.

In the month of June 1812, I exposed to the open air some hives, the Bees of which had perished in 1811; but from what particular cause, I never could ascertain, nor can it be in this point a matter of any moment. Immediately on discovering that the Bees were dead, or that they had forsaken the hive, I removed the hives to a close, dry and dark closet, intending to make use of them in the following season for my swarms. Although contrary to law, I acknowledge I placed three of those hives in my apiary, but

as a salvo to my conscience, it was for the purpose of resting my own swarms, and not catching those of my neighbours.

On the beginning of July, I was surprised to observe that several Bees emerged from the cells of those hives, and their number increased daily. The cause of this phenomenon immediately struck me, and I reflected on the possibility of re-establishing these hives from the mere hatching of their eggs. I gave the Bees some food, and the main question now presented itself respecting the existence of a queen. On this head, I differ from Mr. Ducouedic, who affirms, by a close attention to this rule, queen, drone, and common Bees, will be produced in the hive; this, no doubt, may take place in an individual case, but its completion must ultimately depend on the actual existence of a queen, or drone egg in the hive at the time of the death of the Bees. I cannot say, that during the whole of my experience in Bees, I ever found that they possessed the inherent power of creating at pleasure a queen from any particular egg which they may select for the purpose. Another difficulty also occurs in this case. It is to be supposed, that as the influence of the temperature would operate equally on all the eggs at the same time, there would not be that distance of time in the hatching, which would enable the Bees, which were hatched the first, to select any particular egg, from which a queen was to be born to them.—There are therefore only two methods to be adopted, to turn the Bees thus hatched to any advantage. They must in the first place be either joined to the Bees of another hive, or the earliest opportunity must be taken of extracting from another populous hive, a supernu-

merary queen, and some drones, and thus the formation of a new colony may be effected.

In every spring, and especially when it is rainy, a number of hives perish; either from want of food, from the continuation of humidity, which afflicts the Bees with the dysentery more than any other circumstance, or finally by the pillage of strange Bees. The combs of these hives are immediately melted, for the purpose of the Wax, without any consideration for the brood contained in the cells. This brood not however having died with the Bees, the ignorance of the value of it, ought to be particularly eradicated from the mind of every apiarian.

Whenever the Bees of a hive have perished in the autumn or the spring, the hive should be immediately taken from the apiary, and deposited in a dry place, carefully protected from insects, spiders, mice, &c. When the warm weather has set in, it may be brought from its repository, and exposed to the effect of the sun. Some judgment, however, is necessary in this particular, for I once inadvertently left a hive fully exposed to the rays of a midday's summer's sun, and the consequence was, that when I came to examine the hive in the evening, I found all the combs detached from the sides, and in perfect confusion, having been melted by the excessive heat.

A hive, thus undergoing (if I may be allowed the term) the process of resurrection, should be placed in a remote and retired spot at some distance from the apiary, and care should be taken that it is not attacked by some pillaging Bees, who would in a short time bring so many of their companions, that the hive

must be instantly moved, to prevent its complete destruction.

I, however, never experienced that a hive thus regenerated, swarmed the same year, although Mr. Ducouedic affirms the contrary, especially if the apiary be in the vicinity of heath, and buckwheat.—I do not think, however, that its swarming ought to be promoted, for it must necessarily impoverish it much, and it cannot be supposed to be so strongly peopled as to throw a swarm worth preserving during the winter, but in itself it will form an excellent stock hive for the ensuing season.

CHAP. XXII.

ON THE CUSTOM OF TRANSPORTING HIVES FROM PLACE TO PLACE, FOR THE PURPOSE OF FRESH PASTURAGE, ACCORDING TO THE PRACTICE OF THE ANCIENTS AND THE MODERNS.

WHEN the various seasons are considered in which the flowers bloom, from which the Bees extract their honey, it is surprising that the custom of removing the hives to different situations has not yet been practised by the English, and especially by the Scotch apiarians. The profit which would result from this practice, would more than compensate for the loss of time and trouble, with which their removal would be attended. In Scotland, I have experienced an addition of six or eight pounds of honey, by removing my hives to the vicinity of heath, which is of particular value to Bees, as it flowers, when almost all the flowers, in the gardens and the fields have ceased to bloom. A rich corn country is a desert to Bees, and in the northern countries, and especially in the highly cultivated straths of Scotland, bounded as they are on each side by "heath-covered mountains," the Bees should always be removed in the month of September from the straths to the foot of the hills; and I will venture

to affirm, that the proprietor will find himself amply repaid. I have heard an objection to this system started by several persons, that it is difficult to find a place in those remote regions where the hives would be safe. This difficulty is, however, very easily obviated, as is generally the case, when a disposition to remove it exists: although the mountains themselves are but very thinly peopled, yet at their feet there are many cottages, the owners of which would be very glad to admit some Bee-hives into their kail-yards, for a very trifling remuneration. For the short time of their stay, they would not require any attention from the proprietor, and having depesited them, he need not give himself any further trouble about them, until the flowering of the heath has ceased, when his hives may be brought home again.

In most cases, man is inclined to adopt that mode of action, from which a promotion of his interest may be confidently expected;—it is strange, however, that although I have held forth to many apiarians the signal advantages attending a removal of their hives, they have uniformly listened to me with the greatest attention, but there the business ended.

To a weak hive, this removal must be of peculiar advantage, and when the trifling expence which attends it is put into the scale with that which arises from a constant feeding during the winter, independently of the great trouble which attends that operation, I cannot conceive any person to be so wilfully blind to his own interest as not to adopt it.

I, however, not only recommend in the strongest manner, the removal of hives in the autumn, but I would also wish to see it adopted in the spring in

those places, where the Bees could have the advantage of furze. It is one of the most early flowering shrubs, and the farina of it is sought with great avidity by the Bees; the broom and the sallow are also very early in their flowering, and these are seldom to be found in highly cultivated places. I have experienced the greatest benefit from a month's residence of my hives in the vicinity of furze and broom, especially in regard to early swarms, and that is certainly no mean advantage obtained.

In many countries, the removal of the hives from one pasturage to another, is considered as a very important point in the practical management of the Bee. Savary, in his Letters on Egypt, enters into a long detail of the manner in which the inhabitants of that country transport their hives along the banks of the Nile. The Egyptians, he says, "exhibit great skill in their manner of cultivating the Bee, as the flowers and the harvests are much earlier in Upper Egypt, than in Lower: the inhabitants profit by this circumstance, in regard to their Bees. They collect the hives of different villages on large barks, and every proprietor attaches a particular mark to his hives. When the boat is loaded, the conductors descend the river slowly, stopping at all the places where they can find pasturage for the Bees. After having thus spent three months on the Nile, the hives are returned to the proprietor, and after deducting a small sum due to the boatmen for having conducted his hives from one end of Egypt to the other, he finds himself on a sudden enriched with a quantity of honey and wax, which is immediately sent to market. This species of industry procures for the Egyptians an abundance

of wax and honey, and enables them to export a considerable quantity to foreign countries.

M. Maillet, in his History of Egypt, also makes mention of this custom relative to the pasturage of the Bees.

This system of a periodical removal of the hives was not unknown to the ancient Greeks. We read in Columella, that the inhabitants of Achaia transported their hives to Africa, where the season of the blowing of the flowers was late. Under the term, Africa, we must suppose, that this author is speaking of Egypt. We know that all the fertility of this province depends on the inundation of the Nile, which takes place in the month of June, and ceases in about three months afterwards. We thus account for the flowering of the shrubs being later in Africa, (that is, Egypt) than in Achaia, where, after the month of September, no further pasturage is to be found for the Bees; whereas, in Egypt, it is in its full force after that period, on account of the retreat of the waters of the Nile.

We also know that the modern Greeks, who inhabit the coasts of Asia Minor, towards the Islands of the Archipelago, transport their hives by sea, in order to procure an abundance of food for the Bees. It is not long ago, that a hive on one of these vessels was overturned, and the Bees spread themselves over the whole vessel. They attacked the sailors with great fury, who to save themselves swam on shore. They could not return to their boat until the Bees were in a state of tranquillity, having previously provided themselves with proper ingredients, for creating a smoke, to suffocate the Bees, in case of a renewal of their hostility.

These emigrations also take place in China, in the same manner as in Egypt. A very ingenious method is practised by the people who inhabit the banks of the Po. They load the boats resembling the manner of the Egyptians, and then transport the hives to the vicinity of the mountains of Piedmont. On setting out, a mark is sketched round the boat, from which a scale is drawn, and as the Bees collect the honey, the boat sinks deeper in the water; by looking at the scale, the boatmen know when the Bees have gathered a sufficiency of honey, and they then prepare for their return.

Alexander de Montfort relates, that the people in the vicinity of Juliers, generally convey their hives to the foot of the Mountains, when the wild thyme is in flower.

M. Valmont de Bomare, in his Dictionary, observes, "Great is the advantage of being in the vicinity of a navigable river," for by these means, the spring of a dry country can be united with the autumn of a fertile and umbrageous one, and thereby ample amends are made for the poverty of the country, in which the apiarian may be established.

M. L'Abbé Tessier, Proutant, and others, inform us, that the proprietors of the Bees in Beauce transport their hives every year in the month of August in carts, into the country of the Gatinois, or to the environs of the forest of Orleans, about the distance of ten miles from their habitations. They there find heath, or buck wheat in flower, at a time when in Beauce, after the gathering of the sainfoin and the vetches, no further addition can be made by the Bees to their winter store. W.

This manner of transporting the Bees is called in the country, *leading them to pasture.* A single cart contains thirty or forty hives. They travel only by night, and at a foot's pace, and as much as possible on easy roads. The hives are covered with linen, and are arranged in stories, those of the upper being reversed between those of the lower story. They remain about two months in the place of their pasturage. The peasants take care of them for a very trifling salary. In this season nearly three thousand strong hives are seen in a little village.

When the hives are to be transported, they are placed in the evening individually on a linen cloth, in which they are wrapped, and tied round with bands of straw, osier, or pack-thread. Two men can carry several hives by passing a long stick through the knot of the cloth which covers them. They are thus often packed on horses or asses. They are placed topsy-turvy on the panniers. If they are placed in the common way, that is, on their bottom, they must be raised and sustained at the height of some inches, especially if the journey be of some days length; for it is necessary that the Bees imbibe a renovated air. The swarms which have been newly hived may remain in this state two or three days. In cold weather the hives full of wax, honey, and bees, may be transported to any distance, by taking care only that the combs do not break one against the other: for this purpose they are supported with little sticks.

To these details of M. L'Abbé Tessier, I will add some not less interesting extracted from the Dictionary of M. Bomare. The skilful economists in the Gatinois, after the crop of the sainfoin, transport their

hives into the plains of La Beauce, where the melilot abounds; afterwards into Sologne, where the country is covered with buck wheat, which is in flower until the end of September. This practice is universal in the country, and even the humble peasant imitates the opulent proprietor in the transportation of his hives.*

M. Bomare adds—We are informed by a memoir of M. Duhamel, that the profit which is extracted from the Bees, under the system of transportation, is very considerable. From the month of July, when the Bees have swarmed, and have made an excellent harvest from the sainfoin, the whole of the wax and honey is taken from them, and the Bees are put into an empty hive. The hives are then transported into a country where an abundance of flowers and mellifluous herbs are to be found. If the weather be fine, and the flowers luxuriant, the hives which have been transported in July, are well filled by the latter end of August. They are then changed a second time, and particular care is taken of the brood combs. As soon as the Bees have been thus changed a second time, they are removed into a country in which buck wheat abounds, and supposing the season to be favourable, the hives are so well filled that a third of their combs may be extracted.

Thus, our author concludes, by the aid of human

* I am obliged to notice a very striking contradiction in the two reports of M. Bomare and L'Abbé Tessier. The former tells us, that the transportation of the hives takes place from the Beauce to the Gatinois, and the latter, that it takes place from the Gatinois to the Beauce. It is impossible for me to correct this error, if it be one, nor can I positively say to whom the truth is to be ascribed; but the case may perhaps be so constituted, that the transportation may take place in one season from one country to the other, and at another season, *vice versa*.

industry the most surprising collection of honey is obtained; but it must be confessed, that every year is not equally favourable, and that sometimes the hives can be changed only once. On the other hand, some Bees are more industrious than others. I have seen a very active hive, in the space of twenty-four hours, increased six pounds in honey and wax.*

In the Gatinois sixty or seventy pounds of honey are extracted from a good hive, and nearly two pounds and a half of wax.† The great art in this country, and which a good economist ought never to lose from his sight, is, to have the hives always well peopled with Bees. In the countries which abound not so much with flowers, and where equal care and attention are not bestowed on the hives, the profit obtained from the Bees is much less considerable. In some parts of the kingdom a good stock of two years old may produce two pounds and a half of wax, and from twenty to thirty pounds of honey or more.

I grant that these details are interesting, and capable of exciting in country persons, and landed proprietors, a particular disposition to the culture of the Bee; but still they are not wholly satisfactory. It is not that I doubt the advantage of transporting hives into a fresh pasturage, having myself experienced the

* This is perfectly incredible, it is however faithfully translated: some latitude may be given to the enthusiasm of a naturalist, but upon an economical subject, truth should be particularly adhered to.

† In the Memoirs of the Royal Society of Arts, I find that Mr. Knight of Great Bardfield, Essex, obtained forty-five pounds of honey and fourteen and a half of wax from one hive. There must be some mistake in this calculation. The quantity of wax is out of all proportion to that of honey, nor is it credible that such a quantity of wax could be produced from a single hive

benefit, when it can be done without any great inconvenience or expence: but in the details now given, there is a great inaccuracy, and several contradictions are manifest.

In the first place, in regard to what M. Bomare informs us, according to the memoirs of M. Duhamel, respecting the ample collection of honey and wax, which is extracted in July from hives which have sent forth several swarms, and the Bees of the whole, which are afterwards transferred into empty hives, appears to me to be enveloped in great doubt. It is well known, that the hives which have emitted two or three swarms in the course of a month, immediately after the departure of the last swarm, are merely occupied with the repeopling of the hive, and that until the number has been sufficiently established, Bees do not apply themselves seriously to the amassing of their winter provision. In a climate however similar to that of London, or Edinburgh, the Bees do not begin in general to swarm before the month of June, and before the second swarm is thrown, that month is far advanced. But how can we expect to extract from those hives a sufficient crop in the month of July? Much less then can we expect to form a good stock by removing the Bees into an empty hive.

We are further recommended to take particular care of the brood, which ought to be very abundant in those hives which have swarmed. I however answer, that it is not sufficient to recommend that care, but it is also necessary to impart to the inexperienced practitioner the most easy method of succeeding in that particular department. I acknowledge ingenuously that I am not acquainted with any one, which

can be adopted with propriety in the common straw hive, when it is to be removed.

It is further observed, that the chief aim of the country is to have the hives extremely well peopled; but I ask, what are the methods which ought to be employed by apiarians to effect that aim? It is however most certain, that the method of removing the Bees from the full hive to an empty one, so far from augmenting the population, diminishes it.

In the second place M. de Bomare informs us, that from *sixty to seventy pounds of honey comb*, nearly *two pounds and a half of wax* are extracted, but he subsequently tells us, that *two pounds and a half of wax* are extracted from *twenty or thirty pounds of combs*. This appears to me a manifest contradiction. The same contradiction appears common to all the authors who have treated of the proportion of wax to that of honey. M. Tessier relates, according to Duhamel, that the curate of Tillay-le-Peilleux in Beauce, extracted only five or six pounds of wax from four hundred and eighty pounds of comb; but I am persuaded that a pound of wax can be extracted from ten pounds of comb. This however may in a great measure depend on the state of the combs which are extracted, whether they be old or new, full or empty. If they be new, a greater quantity of wax is produced, in such a manner that a foot square of new comb will yield more wax than a foot square of old. Further, if ten feet square of empty combs be extracted from a hive, the proportion of wax to honey ought to be greater than if they were full. This proportion is most evident. I therefore maintain, that in order to know the true proportion of

these two productions of the Bee, a comb quite new should be selected, which I will suppose to be a foot square, and full of honey: this comb must be weighed, the wax is then melted separately, and weighed, and the result of this experiment will determine the two proportions of honey and wax. If this same comb were old, we might suppose that it would yield less wax, but experience proves the contrary, for if we take the upper parts of three combs of four inches broad to form the square foot; they will yield a much greater quantity of wax, because the upper parts of the combs, which are attached to the superficies of the hive, are more solidly built, and contain more wax in proportion than the remainder of the comb.

In regard however, to the transportation of the Hives, it is fair to hear both sides of the question, for it is only from a collision of sentiments, that truth can be elicited. M. Ducarne, no mean naturalist, utterly disapproves of the system, and the following are the grounds on which his opinion is founded. "A friend of mine," he says, "who was a great advocate for the transportation of hives, sent them four "years successively to the buck-wheat, and one only "succeeded; in the other hives, the Bees actually lost in "their weight. The disadvantages, and losses attending the removal appear also to be carefully concealed "by its advocates, for they forget, and I suppose wilfully so, to mention, that sometimes a quarter, and "even half of the hives are destroyed on the journey, especially if the buck-wheat be situate more than three "or four miles from the place whence they set out. "Although on conducting them, every attention be

" paid to cover them with very fine net work, or other " substance, in order to give the Bees plenty of air, " and to place the hives in the carriage topsy-turvy " yet, if the weather be at all hot, a great number of " Bees die by suffocation. Another very important " injury is sustained during the removal; for it gene- " rally happens that the old hives, which have not " been turned, are pillaged by the others, and even " sometimes by the Bees which are transported on " other carriages. M. Ducarne also says, that the " honey obtained from the buck-wheat is of little va- " lue, and sells for half the price of the other honey."

The objections of M. Ducarne are however easily answered, for, in the first place, he never tried the system of removing his hives to a fresh pasturage, and his conclusions are therefore drawn from the mere *ipse dixit* of others. In regard to the circumstance, that one hive only succeeded of a number that were removed for four years, it is very possible that a combination of circumstances might have taken place injurious to the collection of honey. Some years are certainly not favourable to the removal of hives, and if it should happen to be undertaken in one of those years, the system itself must not be blamed for the failure. The proprietor has it always in his power to make himself acquainted with the richness or poverty of the pasturage to which he is going to remove his hives, for as the secretion of the melliflu- ous fluid depends in a great measure on the temperature of the season, it may happen that, although the extent of the pasturage may be such as to warrant the proprietor in the expectation of a great harvest of honey, yet certain circumstances may coalesce

to defeat that expectation, and with which the proprietor ought in some measure to have been acquainted previously to the removal of the Bees.

Respecting the great loss which the proprietors sustain by the carriage of the hives, I am enabled positively to contradict it, and I can also produce the testimony of some most skilful naturalists and apiarians. During my travels in Germany, and particularly in Hanover, I had frequent opportunities of witnessing the travelling apiaries, and I was informed by one proprietor, who had followed that occupation for above twenty years, that he never lost a single hive by the mere casualties of the journey; and my surprise increased, when he told me, that he was sometimes obliged to remove them to the distance of thirty miles, which occupied a period of four days. Intelligent however, as this apiarian was in many respects, and well grounded as he appeared to be in the natural history of Bees, he was a decided enemy to the system of deprivation. He universally suffocated his Bees at the close of the season, though not, he said, until he had tried every method, which different authors have recommended, for the preservation of the Bees. I have, however, some idea that he entered upon the practice of saving the Bees, with a deeply rooted prejudice against it. His adherence to it, therefore, would have been a great wonder. I am particularly surprised at the assertion of M. Ducarne, that the old hives are often pillaged during their removal, and on their arrival at the place of their pasturage. It is universally known, and M. Ducarne cannot have been ignorant of the fact, that the Bees never take to the nefarious system of pillage as long as there is any honey to be found in

the fields. It is only in the latter end of September, when the honey is exhausted in the flowers, that the Bees rob each other, but I never experienced it, during the honey season.

In the vicinity of Paris, the hives are transported to the pasturage of Pierrelaye, a village on the road of Pontoise, where the buck-wheat is much cultivated. The hives which are thus moved, are placed in the gardens, in the fields, and by the sides of the hedges, where they are protected from the strong prevailing winds. The persons to whose care they are entrusted, are answerable for them not being stolen, nor overturned.

It may appear almost incredible, but I can vouch for the truth of the statement, that a hive which, when taken to the vicinity of heath, weighed only twelve pounds, had, at the time of its being brought home, increased sixty pounds, and the expense of removing, with the sum paid to the cottager for allowing it to stand in his garden, did not amount to five shillings, and four or six hives might have been moved for the same expense as one.

These instances of the great advantage, which attends the removal of Bees in search of pasture, afford an excellent lesson to many places in this kingdom, especially where large rivers present the means of easy transportation. They direct particularly the inhabitants of the rich vales, where the harvest for Bees ends early, to remove their hives to places which abound in heath, this plant continuing in bloom during a considerable part of the autumn, and yielding great plenty of honey to Bees. Those in the neighbourhood of hills and mountains, will save the Bees a great deal of labour, by taking also the advantage of shifting their places of abode,

CHAP. XXIII.

ON THE ROBBERIES OF BEES, AND THE METHOD OF PREVENTING THEM.

I HAVE already treated of the enemies of the Bee, in regard to itself, and its provisions, but the greatest evil which can befal a hive, is an attack from the Bees of a stranger colony. The pillage which is mutually carried on by the Bees, is the cause of the loss of a greater number of Bees and hives than all the attacks of their other enemies.

The first cause which excites the Bees to plunder is greediness, and a continual desire of collecting provisions to convey to their own domicile, and it is in general the Bees of those hives which are most amply provided with provisions, that carry on the pillaging system to the greatest extent. Strong and vigorous in themselves, they have nothing to fear from the attack of others, and it is only the weak hives which suffer from the pillage of their own race. Want and necessity may, however, be sometimes taken into the account, for it may happen that the best peopled hives are precisely those, which are the most in want of provisions, and they therefore fall upon the weaker societies, which from the paucity of their numbers are better provided with food.

There is, however, another source of this evil, and which is very prone to happen in the common straw

hive. This arises from the moths, or other insects which penetrate into the hive, and there multiply, devouring and spoiling all the works of the hive in such a manner, that the Bees, judging it most prudent to forsake their domicile, defend it but weakly, and then leave it, as a prey to the first comers. Afterwards perhaps these wandering and vagabond Bees seek in their turn to live at the expense of others. If they be very strong, they besiege another hive, they drive out the lawful proprietors of it, and ravage their provisions without mercy. Those which have been driven from their dwelling, go in their turn in quest of food, or rather on the pillaging system, and thus the evil becomes contagious; the best furnished hives are from this cause often seen desolated, and reduced to nothing. The Bees of those hives, which have been gnawed by the mice and other animals, and which have experienced the cruel visits of the wasps, and the hornets, are often obliged to forsake their homes to seek for their subsistence in other hives more healthy, or better furnished.

These are, in short, the principal causes of the pillage of the Bees, an evil which is of such serious and injurious consequences to them.

There are some days, in which the pillage is carried on to a much greater extent than others. This is a remark, which it is very easy to make. The pillage is most to be feared after two or three days of rain, when the weather is not suitable to the collecting of honey, because hunger presses more violently on those which have suffered from a want of provisions, and as idleness is the mother of all vices, the Bees

having nothing better to do, visit their neighbours, and rob those which are weaker than themselves.

In regard to the seasons, in which the evil exists to the greatest extent, it may be reckoned that there are two in the year. The first may be computed from the month of March, to the 5th or 6th of May. From that time to the end of August, or the middle of September, it is very rare that a hive is attacked by robbers. As soon as the honey begins to decrease in the fields, the pillaging Bees are seen hovering round particular hives, as if reconnoitring the particular point on which the attack is to be made. I would advise the apiarian to pay particular attention to that hive, about which he sees a number of Bees hovering on the wing; their presence bodes no good to it, and he must not be surprised if, in a few days, he finds it formally and vigorously attacked by a whole host of robbers.

As however, in all cases, prevention is better than a remedy, it is most necessary that the apiarian should be acquainted with the principal signs which display themselves, when a hive is about to be pillaged.

In the first place, when a hive is undergoing pillage and plunder, a more than ordinary noise is heard before the hive, and indeed in the whole garden; and if the ear be placed to the hive, the noise is then very considerable. This arises from the motion of the Bees; some defending their provisions; others robbing them, and as those Bees, which are seen to enter in crowds, come, and depart in the vicinity of the apiary with great glee and precipitation, the increased noise is accounted for, which is heard in the garden.

Battles, and duels are then seen at the entrance of the hive, which is besieged at all parts; some Bees enter, others depart in haste, and almost all of them are fighting; some to effect an entrance by force; others to hinder it, and to drive those out which have already gained admittance. Some are observed pursuing others, whom they catch hold of by their hinder legs, or their wings, and which are hastening away at full speed. Others fall upon those, which arrive, and often upon one of their own community, whom they are prevented from recognising, by the anger which they are in, and to whom they give no more quarter than to the strangers. In fine, it is a disorder, a confusion, a frightful carnage before the entrance of this ill-fated hive, which scarcely knows friend from foe, and attacks each without discrimination.

I am here supposing the robbery to exist in all its force, and in that case I am not aware of any remedy which will avail. But at its commencement, the commotion which then exists, compared with that which has been just described, is like the battle on the Serpentine river to the fight of Trafalgar.

When therefore, you see several Bees hovering with rapidity about, and particularly before the entrance of the hive, and you see them alight at times near the Bees, which guard the entrance, and fly away with celerity; and finally, when a Bee of the hive recognises the daring robber, then tremble for your hive. These may be called the foragers or the advanced-guard, who are sent forth to notice the most vulnerable point of the place on which the attack is intended to be made. Further, if on closely observing the hive, you perceive

a Bee dart upon one, or upon a number of others, which hover about the hive, and that this Bee, after having pursued his enemy, returns immediately to regain his companions, and places himself with them in a menacing posture, which is not difficult to be discovered by those who are in the habit of watching the motions of these extraordinary insects, the conclusion may be instantly drawn, that this hive is threatened with robbery. These bold and audacious robbers are seen to pass with an astonishing rapidity before the entrance of the hives, where the domiciliated Bees are always on their guard against their enterprise. Sometimes they alight with the greatest effrontery, in the very midst of those who guard the avenues, and then take to their wings with the utmost precipitation, when they see some of the domiciliated Bees, who having no idea of taking a joke, pounce upon them, and like the death-head hussars, give no quarter to their enemy.

At another time, when the robbers delay their escape too long, a Bee of the hive catches it by the hinder leg, and yields not its hold, until the intruder takes wing, dragging his enemy after him. If during the dispute two or three other Bees should come to the assistance of their companion, woe then to the robber, he is seized by his legs and his wings, and he may think himself fortunate if he can effect his escape.

When these signs present themselves to your view, you then have every thing to fear for your hive, and if instead of one or two Bees hovering about it, you see a number, you may then conclude that the weakness of the hive has been discovered, and that it is on the eve of being formally, and regularly attacked. It

becomes therefore a particular part of the duty of the apiarian to pay frequent visits to his hives in the season when the robberies commence. Particular care, however, should be taken not to confound the robbing Bees with the young ones, who from the hours of twelve to four, amuse themselves by flying in great numbers about the hive, and whose motions very much resemble those of the pillaging Bees. There are, however, particular signs by which the attentive observer may distinguish the young Bees from the strangers who are meditating an attack. The young Bees keep constantly before the entrance of the hive, and they have always their head turned towards its centre ; whereas, the besieging Bees, surround the hive in all quarters, without maintaining any particular position.

I generally adopt a very simple method of ascertaining if the Bees, which are in groupes before the hives, belong to my own apiary, or if they be robbers. I sprinkle some fine flour on the Bees, and I then watch if any of them enter the hive without opposition, which immediately determines if they be friends or foes.

In regard to the prevention of pillage, if you have a weak hive in your apiary, of which you have any cause of fear, I would advise the following plan to be adopted.

It must be instantly removed from the apiary, and placed in a corner of a garden, about 5 or 600 paces, or a quarter of a mile distant, and it should be then covered with branches or faggots, to protect it from the view of the Bees, flying into the fields for food. The entrance may be left unclosed, and which

must be so contracted as to admit only one Bee to come out at a time, which is very easily done with putty or clay, or with a piece of perforated tin, of the shape of fig. 8. p. VI. and it must be left in this state until you perceive that the hive is tranquil, and is no more molested by the others.

The removal of the hives may, however, in some measure depend on the discretion and judgment of the apiarian, especially when the pillage is supposed to proceed from two or three bad days for the collection of honey; because, under such circumstances, it would be sufficient to close the entrance of the menaced hive, leaving only a small aperture for the Bees to respire. I in general follow this plan, whenever I see a hive threatened by robbers, but, if on opening it two or three days afterwards, I still perceive it in danger, I then lose no time in removing it.

As the majority of the hives, which are tormented with robbers are weak, and in want of provisions, it would be advisable to give them a little food in the evening after sun-set, taking care at the same time so to close the entrance that no strange Bees may gain admittance, for were this not to be done, you have only increased, and not removed the danger of your hives.

I have however, experienced that the removal of a hive to a distant place, is not always a cure for the evil which prevails, for the activity and vigilance of the Bees are such, that they will discover a weak hive at any distance from the apiary. Under these circumstances, I advise the proprietor to take the hive into a granary, or other out-house, in which there is a window fronting the south, at which the hive must be placed; but the entrance so closed, that no Bee

can come out. A little food should be given them, and in about three or four days, the window may be opened, and the Bees set at liberty. This however, must only be done in very fine weather. Should the hive be discovered by the strangers, the window can be immediately closed, and all further attack is then prevented. In this case, however, a number of Bees will be necessarily excluded, who actually belong to the hive, and which cannot perhaps be admitted without also admitting the strangers. In the course of an hour, however, the strangers disappointed in their expectations will retire, and the lawful Bees may then be permitted to return.

When a hive is removed, a *ruse de guerre* should be adopted, and an empty hive should be put in its place; this will amuse the robbers returning on the following day, and will prevent them attacking any other, which might be too weak to oppose them; for the same proverb holds good with Bees, as with men, that stolen goods are sweet, and when the Bees of a hive once take to robbing, they follow the occupation with the greatest zeal, and the best apiary will under these circumstances be soon depopulated.

As scarcity of food is the real cause of the robbery amongst Bees, it may in some degree be prevented by a judicious method of feeding; but as it is impossible to inculcate a proper management of the Bee into the minds of some individuals, it may happen, that your neighbour is remiss in feeding his weak hives, and you are thereby exposed to the robbers from his apiary. Against this circumstance there is no remedy, but a removal of the hive according to the directions which have been already given.

CHAP. XXIV.

ON THE ADVANTAGES WHICH ACCRUE TO THE STATE, AND TO INDIVIDUALS, FROM THE CULTURE OF THE BEE.

WAR has its uses, as well as its miseries; it calls forth the energies of a nation, and draws its attention to its own internal resources, and renders it at the same time independent of the natural commodities of other nations. Thus until England was at war with Russia, it was not discovered that we were paying an enormous sum annually to that country for a metal which we possessed in our own native mountains, and also for that timber, which it would take millenaries to exhaust from our own American colonies. It is also a notorious fact, that this country pays annually to the north of Germany from £10,000 to £50,000 for the produce of the Bee*, when that same produce could be obtained in this country at a comparative small expense, and by which the condition of the lower orders of the peasantry would be essentially ameliorated. Unfortunately in this country, the culture of the Bee is made more an object of

* In one ship, the Aurora, from Papenburg, was imported this year, (1814) 41 casks of honey, weighing 08 cwt. 1 qr. 23lbs. or 7607 lbs.; and in about a week afterwards, another vessel was entered at the Custom-House, in London, bringing 8424lbs. making in two ships only, the enormous quantity of 16,088lbs. of honey. The Zeelust, from Amsterdam, entered 19th May, 1814, brought over 4hhds. and 12 casks of honey, weighing 50 cwt. 2 qrs. 14lb.

amusement than of profit. In the gardens of the nobility and the gentry, a few hives are seen; but you are informed that they are glass, for the purpose of seeing the Bees work; a circumstance which no person ever yet beheld, and I may venture to say never will. If you leave the gardens of the great, and turn your view to the more humble one of the peasant, you in general view it deprived of its chief ornament, which I consider an apiary, whether regarded with a view to profit or rational amusement. Poverty may indeed be one obstacle to a more extended culture of the Bee; but prejudice, founded on fear, has a greater share in it. Some farmers are, I am persuaded, not aware of the profit attending a well conducted apiary, or they would not so glaringly neglect such an essential branch of rural economy. There is not one branch in which the profit is so great, compared with the expense attending it, and in which the management absorbs such a small portion of time. This circumstance alone is one great argument in favour of an apiary, and in the eye of the economist, renders it of great importance.

I will state the profit of five years on a fair and equitable scale, making at the same time ample allowance for those losses, which even the most skilful apiarian cannot prevent. I will suppose a person to buy a swarm in 1812, for which he pays one guinea:* there is little doubt of the Bees making a sufficiency of honey to keep them until the ensuing spring; and after having diminished the entrance, and fastened the hive on the stool, the apiarian has

* I have here rated the price of a swarm at the maximum. In the country it may be purchased for seven or ten shillings.

no further trouble until the spring, when his Bees begin to work. In the month of May or June his hive swarms, and in about ten days afterwards he obtains another swarm, which is called a cast. His apiary now consists of three hives, from one of which (the cast) it will be most prudent for him to take the honey; as from the smallness of the number of Bees, and lateness of the season, it seldom makes honey sufficient for its support. I will suppose the cast to weigh fifteen pounds: these will bring him, if sold, twenty-two shillings. Thus in the first year the apiarian has received back the price of his original hive, and he has doubled his stock. The second year his two hives produce him four swarms. I would then advise him to sell his casts, which will bring him fifteen shillings each, and add his two swarms to his stock. He has now four good hives, and at the expiration of every year let the apiarian weigh his hives, and take from them all above thirty pounds, that quantity being sufficient for the support of the best peopled hive through the longest winter. I will suppose, on an average, that each hive could spare him ten pounds; the second year he has therefore received one pound ten shillings for two casts, and forty pounds of honey comb, which at one shilling and six-pence per pound, (but which sells in the shops, at three shillings and six-pence or four shillings) produce him three pounds. The third year, his four hives produce him eight swarms. He follows the same plan as in the preceding years, and at the commencement of the fourth year his apiary consists of eight stocks. At the beginning of the fifth year, his apiary has increased to sixteen stocks. I will now calculate the actual profit.

Dr.	£.	s.	d.	*Cr.*	£.	s.	d.
1812,—To one swarm,	1	1	0	1813,—By one cast...	0	15	0
1813,—To two new Bee-hives.....	0	4	0	By 10lbs. of honey taken from the first swarm, at 1s. 6d. per lb...	0	15	0
1814,—To four new Bee-hives.....	0	8	0	1814,—By two casts,	1	10	0
1815,—To eight new Bee-hives.....	0	16	0	By 20lb. of honey-comb taken from the two swarms.	1	10	0
1816,—To sixteen new Bee-hives.....	1	12	0	1815,—By four casts,	3	0	0
1817,—To thirty-two new Bee-hives.....	3	4	0	By 40lbs. of honey-comb taken from the four swarms.	3	0	0
To ten pounds of sugar for feeding the Bees, if necessary, at 8d. per lb	0	6	8	1816,—By eight casts	6	0	0
To thirty-two stools for the hives, at 2s. each.....	3	4	0	By 80lbs. of honey-comb taken from 8 swarms	6	0	0
To incidental expences.....	1	1	0	1817,—By 16 casts...	12	0	0
				By 160lbs. of honey-comb taken from 16 swarms.	12	0	0
£.	11	16	8	£.	46	10	0
				Deduct..... £.	11	16	8
Actual profit in five years ..... £.					34	13	4
If the apiarian wishes to keep only ten hives, he can then sell twenty-two at £.1 1s. each..... £.					23	2	0
				£.	57	15	4

Thus his profit at the expiration of five years, will be £57. 15*s.* 4*d.* and leaving him ten good stocks in his garden. I have not enumerated in this estimate,

any probable profit which may be derived from virgin swarms, but I trust I have demonstrated the certain profit which can be obtained from a well-conducted apiary.

I am however, fully persuaded, that the use of the common straw hive tends more to obstruct the culture of the Bee than any other cause. Its shape is particularly inconvenient for the performance of the different operations which the Bees require, and on which the profit of the proprietor principally depends. The operation of deprivation is attended with those difficulties, which naturally deter those who are not enthusiastically attached to the Bees, and this sentiment must not be looked for in the minds of those, whose only aim in their culture is pecuniary advantage. It is only my enthusiasm and attachment to those insects, which could possibly induce me to persevere in the arduous undertaking of depriving the Bees of their store from the common hive, and I am not therefore surprised at the general use of suffocation.

The profit which is obtained from Bees, stands in no proportion with the little time and trouble which their culture demands, and this is sufficient to induce those who calculate things properly, to give the culture of the Bee the preference before all other agronomical occupations, especially as no sacrifice of property, nor extensive capital are necessary for its prosecution. From the same fields which yield corn to man, and forage to beasts, the diligent Bee extracts its food, without diminishing in the smallest degree the crop destined for human or animal support. The same trees which the Creator has formed to furnish

the most delicious fruits, and wood for the use of man, yield also to the industrious Bee, the materials with which it forms its combs, and which are afterwards applied to the use of man.

As a proof of the importance which was formerly attached to the culture of the Bee, Wildman quotes a modern author, who affirms, "that when the Romans became masters of the island of Corsica, they imposed a tribute of wax on the inhabitants, which amounted to 200,000 pounds per annum; supposing therefore, that the island retained the same quantity for its own use, we have then 400,000 pounds of wax made in one island, by these wonderful insects. It is known that the proportion of wax to honey, is about one to fifteen or twenty, at least, it is in this proportion that it exists in this country. In multiplying those 400,000 pounds by fifteen or twenty, we have more than six or eight millions pounds of honey, independently of the 400,000 pounds of wax. What a source of riches for the island of Corsica, if the culture of the Bee was carried on to that extent as formerly, especially as the price of honey and wax is so much higher now than it was then.

I must confess, that the above calculation appears to be rather exaggerated, but making every due allowance for that exaggeration, it is sufficient to shew the actual profit, which a kingdom may derive from the culture of the Bee.

I have by me a French newspaper of the 21st of September, 1787, in which there is an article dated Hanover, August 30th. "The culture of the Bee is one of the objects of the industry of the inhabitants of this province; the produce of wax is estimated this

year, (1787,) at 300,000 pounds; if we multiply this 300,000 by fifteen, we find that Hanover alone in that year, produced 4,500,000 pounds of honey. A most incredible quantity to be collected in globules, by a particular species of insects."

In France the culture of the Bee was formerly more attended to than at present, although I rejoice to see that it is fast emerging from the obscurity in which it has been so long enveloped.* The cause of the decline of the culture of the Bee in France is to be attributed to the excessive imposts with which the country people were burthened, and for the payment of which their hives were taken from them.†

In the work of M. Necker, on the Administration of the Finances, he mentions that the government having demanded of the prefects of the provinces an exact list of all the hives which were kept in their district, the proprietors of the hives on being informed of the circumstance, were alarmed at the consequences which might result, and destroyed their hives entirely. They feared that a tax was about to be

* In France the culture of the Bee gave rise to certain laws and seigniorial rights, and especially to that of *Aboilage or Abeillage*, which is a right possessed by landed proprietors in certain places, of taking the Bees which may be found in the forests belonging to their domain. *Aboilage* is also a right established in several countries, by virtue of which the lords of the soil may take a certain quantity of Bees, wax, and honey, from the hives of their vassals.

† By a law of the 28th of September, 1791, concerning agricultural effects, art. 2. of the 3d. section, it was decreed, that Bee-hives shall not be seized nor sold for any public contribution, nor for any other debt. By the 524 art. of the civil code, it is decided that Bee-hives form a part of the estate on which they are placed, at least with one positive exception, that he who sells an estate on which there are Bee-hives, cannot take them away, unless it be positively stipulated to that effect in the contract.

laid upon them, and thus for a length of time the culture of the Bee was wholly neglected in France.

Although the inhabitants of the Ottoman Empire, are not the richest people in Europe, they may be placed on a level with the people of the majority of other states. This can only be attributed to the goodness and the fertility of the soil, which although it be slightly cultivated, is sufficient to maintain the people in a sort of ease and independence, and also to the culture of Bees, which is carried on to a great extent in all the provinces of the empire, and especially in the maritime provinces. The immense quantity of wax which the Europeans annually draw from Smyrna, Salonichi, and the Morea, and other countries of the White Sea is well-known. In regard to the Black Sea, in the work of Peysonnel, on the Commerce of the Turkish Provinces on the Black Sea, he says, p. 125, "Wax is the most important article of commerce of Moldavia and Wallachia; it is of a very fine quality, but the wax of Moldavia, is preferable to that of Wallachia; it is sold at the same price." Speaking of the commerce of Bulgaria, he says, p. 162, "an immense quantity of wax is exported from Bulgaria; it is yellow, and of an excellent quality. It is sold in a pure state; its price is from thirty-eight to forty-two paras the occa. The para is about 1s. 6d. and the occa about three pounds."

In the Archipelago, when a peasant has succeeded in raising for himself a capital of twenty or thirty hives, he considers himself fully able to provide for the wants of his family, by adding to their profit the proceeds of his weekly labour.

M. Montelle, in his book entitled, *Choix de Lectures*

Geographiques et Historiques, Tome 5, *Part* II, says, in speaking of the island of Cuba. "When the Floridas were ceded in 1763 by Spain to England, the five or six hundred miserable beings who vegetated in those regions, took refuge in Cuba, and carried with them some Bees: this useful insect repaired to the forests, established themselves in the hollows of old trees, and multiplied with a celerity which appeared incredible. The colony in a short time, which purchased a considerable quantity of wax for religious solemnities, soon collected a sufficiency for those pious customs and other consummations. In 1770, there was a small superfluity, and in seven years afterwards, 7150 quintals were exported to Europe and America. This product necessarily increased under a climate, and on a soil which are equally favourable to it, in an island where the hives yield four crops every year, and where the swarms succeed each other without interruption."

In support of what has been here advanced by M. Martelle, we find in the work of Don Ulloa, entitled, "Philosophical and Historical Memoirs concerning the Discovery of Spain," the following passage:

"I ought not to pass over in silence, that the swarms of Domestic Bees have much multiplied in the isle of Cuba, in the vicinity of the Havannah, during the short space of time from 1764, after the peace had been concluded with England. There were no Bees in the island before that period, for those which were seen, were wild, and of a different species. The families, which until that period, had resided at St. Augustin, in Florida, having repaired to the island of Cuba, brought with them some

hives, which were placed at Guonavacoa, and in other places from mere curiosity. These insects multiplied to such a degree, that they spread to the mountains, and it was observed that they began to be prejudicial to the sugar canes, on which they fed. Their fecundity was so great, that a hive yielded a swarm, and sometimes two in a month. There is not that care bestowed upon them which there is in Europe. The wax is uncommonly white, and the honey of a perfect transparency and an exquisite taste. According to this statement, it is evident that honey and wax might become one of the most advantageous branches of commerce for this island, without bestowing much attention on the Bees, nor neglecting the sugar-cane, which will be always the principal object."

I once inquired of a respectable inhabitant of St. Domingo, why the culture of the Bee was neglected in that island. He answered me, that it was because those insects ravaged the sugar-canes, and because the nudity of the negroes exposed them to be much incommoded. Don Ulloa is of the same sentiment in regard to the havoc done to the sugar-canes, but I confess that I do not see how it can take place; if the Bees imbibe the mellifluous juice which may flow from the cracks or chasms in the sugar-canes, it appears to me that it is not a real loss, for this juice would evaporate, or it would become the prey of other insects; it would therefore be more advantageous for the Bees to profit by it: and even supposing that a superabundance of hives occasioned some diminution in the produce of the sugar-canes, would not an indemnity for this loss be found with usury, in the quantity of honey which the hives would

yield, and especially by the rich crop of wax which they would furnish.

In regard to the negroes who, on account of their nudity, are exposed to the stings, the answer is very clear; for the Bees never attack any one in the open fields, excepting an attempt be made to catch them when they alight on the flowers. Besides, might not a particular dress be adopted for the purpose of attending the hives. The advantage which the colonists would derive, would amply repay them for the little extraordinary expence.

On all the coasts of Africa, the negroes are well acquainted with the management and culture of the Bee, and the quantity of wax which the Europeans derive from that country, is the best demonstration of the fact; their nudity does not prevent them from paying the proper attention to their hives, and we have no proof that they ever make use of any particular covering or guard.

There are, however, some persons who fear, that by multiplying the Bees in the sugar islands, the persons employed in the sugar manufactories would be much incommoded. But if the Bees found a sufficiency for their support in the fields, they would not repair to the houses to torment the inhabitants. In the Archipelago, the natives perform the different manipulations of honey, without any fear or danger, when the fields yield a sufficiency of food for the Bees; but if St. Domingo, as well as Cuba, always furnish an amplitude of food for the Bees in all seasons, no fear whatever need be entertained of the work people in the refineries.

There is however one prejudice which exists in

this country against the Bees, and although it be confined to the lower classes, it still operates materially towards a prevention of an extended culture of the Bee, and this is, that they are fully persuaded, that the Bees are very injurious to the fruit trees. In imbibing the honey from the flowers, they assert that the Bees derange the fecundation, and the premature fall of the fruit is solely to be ascribed to the action of the Bee.*

On this subject, it may be curious to notice the observations of the famous Linnæus, "It is not yet determined," he says, "if the Bees and other insects which feed on honey, occasion any injury to the little embryos, or cause any obstruction to generation by imbibing the nectar of the flowers. Accordingly it cannot be actually explained according to the laws of nature what Quintilian and Seneca report of a villain, who infected the flowers of the trees with poison, in order to kill all the Bees of a poor peasant, which came to imbibe the honey."†

* Several ridiculous notions exist in the minds of the common people regarding Bees; they believe that purchased Bees never prosper, unless therefore a peasant can obtain the gift of a swarm, or has something which he can give in exchange, he will rather relinquish all the profit attending the management of a few hives, than purchase one. In some parts of England the Bees are not suffered to go out on Wednesdays nor Fridays.—A belief is also entertained that they are subject to witchcraft; this prejudice is derived from the Greeks, (*Herod. lib. 2. cap.* 281.) who had their magicians, who pretended to tell the fortunes of persons with the productions of the Bee.

The 10th of August is considered by some people as a day of jubilee amongst the Bees, and the Bees which are seen working on that day, are called Quakers, from those people not observing any holidays.

In Switzerland, when the master of the house dies, the Bee-hives are all lifted up, even in the midst of winter, which is a proof that Bees do not perish with cold.

† *Utrum verò insecta aliaque mellisuga animalcula sorbendo necta-*

Notwithstanding the doubt which M. Linnæus entertains on this point, I am very well convinced that the suction of the honey which the Bees as well as other insects perform on the flowers of the trees, is not by any means prejudicial to them, nor deranges the fecundation in the slightest degree.

rium è floribus, dum num inferant tenellis embrionibus, nondum evictum est; ideoque iste locus Quintiliani et Senecæ de divite inficiente flores suos veneno, ut pauperis apes mel ejus furantes perirent, vix acne vix quidem secundum naturæ legem etiam nùm explicari potest. Amæn. Acad. T. 6. Diss. 115. p. 265.

CHAP. XXV.

DIRECTIONS FOR THE PURCHASE OF HIVES.

THERE is no commodity in which a purchaser can be so soon deceived as in a hive of Bees, and it is only the experienced apiarian who can detect the particular defects of his intended purchase, and for this reason, I would always advise the novice in Bees never to undertake the purchase of a hive on his sole judgment, but if possible to be always accompanied by a person well experienced in Bees, and who can immediately discern the intrinsic value of the hive which is to be sold.

The greatest inconvenience attending the purchase of a hive, is that few persons have the ability or courage thoroughly to examine it; the value of a hive can only be ascertained by a minute and close examination of its interior: for this purpose, presence of mind is an indispensable quality, and in the early attempts of the young apiarian, it has always been my aim to impress it on his mind, that coolness and fortitude can alone insure him success.

The first act of the purchaser should be to examine the exterior of the hive; if the straw be decayed and rotten, the ligaments loose, and frequent blotches ap-

pear, which evidently shew that it has been mended, let him reject it altogether. It is of no consequence that the combs be new, if the hive be rotten, and the purchaser will soon find that he has full reason to repent of his bargain, from the incessant trouble and vexation which the decayed state of his hive will cause him. The country people are in general too inattentive to the condition of the hive in which they put their Bees, and this arises from the supposition that it is of no consequence in what condition the hive is, in which they put their swarms, as it is their intention to murder the Bees at the close of the season.

Being well satisfied with the exterior state of the hive, the most difficult part now arrives, which is the examination of the interior. If the combs are black and ill-flavoured, it is the certain sign of an old hive, but if they be of a pale yellow, it indicates a young hive; even in this point of view however a young and inexperienced apiarian may be deceived. In the common straw hive, when the combs have been extracted on either side, the Bees will soon construct new ones, and from the colour of these combs the purchaser might be inclined to consider the hive a young one; it is not the side combs however, but the middle ones which should be examined, and the colour will immediately indicate the age of the hive.

Some criterion may also be formed of the age of a hive by the number of queen cells which are to be seen; if they be numerous, no doubt can exist of the oldness of the hive. The purchaser should also examine the combs as high as possible; for it is in the upper part of the hive that the moths begin their ra-

vages: these vile insects are however seldom to be found in a new hive, and whenever the slightest symptom of their presence presents itself, which is known by the sides of the combs being gnawed, let the purchaser immediately reject the hive; for Bees can never prosper when those insects have once got a footing in their domicile.

The best time for the purchase of a hive is either in the month of February or at the swarming season. It is to be taken for granted, that a hive in February has survived the dangers of the winter, and the purchaser has then only to attend to the population of the hive, and to its apparent age. In February and March the season has commenced for the operation of the Bees, and the richness of the population of a hive is then determined by the greater or less activity of the Bees. In one hive the inhabitants will be all bustle and labour, whilst in another, a deadness and stillness will be perceptible, which declare that some natural cause operates to effect a tardiness in their labours, and from such a hive an early swarm cannot be looked for.

If a person enter an apiary, with an intent to purchase, let him stand a few minutes before each hive, and observe the number of Bees which enter loaded with farina, and if an apparently equal number leave the hive in great hurry and bustle. This circumstance will determine the health of the hive, and the fecundity of the queen. If a loud humming noise be heard in the interior of the hive, it is a certain sign of its strength, and that the inhabitants are in a prosperous state.

A person should not purchase a hive of his proxi-

mate neighbour, as the Bees are apt to return to their former place of abode; for although no fear need be entertained, that the Bees will ultimately forsake the hive, yet they are obstructed in their labours by a confused recollection of their former home, and this proves of great loss to the community. The best criterion however for the purchase of a hive is the weight, but in this point very nice discrimination is necessary between an old and a new hive; the former necessarily contains a great quantity of Bee bread, which is the heaviest substance in a hive, and the purchaser will then be deceived; for instead of honey he will be buying farina, and also be led astray in his opinion concerning the want of his Bees for food. A hive in February should not weigh less than twelve or fifteen pounds; it would be imprudent to purchase a hive of an inferior weight: if purchased in the autumn, the weight should not be less than thirty pounds; one of twenty-five pounds may survive the winter; but it is so very dependent on certain circumstances, and which in general happen nine times out of ten, that without the aid of food, the hive would perish before the ensuing spring.

Having made the purchase, the next consideration is, the transportation of the hives to your own garden. If a navigable river or canal be in the vicinity, it is by far the most eligible mode of carriage, as there is no danger of the combs being broken by the motion of the vehicle; this advantage is however, so very rare to be met with, and the manner of conveyance so very easy, as to require in this place no particular description. Land carriage is however, attended with some difficulty, and the greatest precautions are neces-

sary to prevent the total ruin of the hive. The first operation is to raise the hive gently, and to place it on a board in readiness for the purpose; the entrance must then be closed, to prevent any of the Bees from coming out; but if the distance be great to which the hive is to be conveyed, care must be taken not to stop up the entrance wholly, as the Bees would be in danger of being suffocated. Having closed the entrance properly, a sheet must be then wrapped round it, and tied in a knot at the top, through which a strong pole is passed.—It is then carried in this manner by two men, the hindermost one keeping it constantly steady, and no danger can then be entertained of the combs breaking. It is not advisable to carry a hive on the head, for the motion of the body tends very much to derange the combs, and should it happen that the hive is moved in the summer, when the heat of the weather has rendered the wax soft, the least motion is apt to break the combs, and the honey is more ready to flow, as not being so viscous as in winter.*

The best time for moving a swarm is on the evening subsequently to its being hived. The motion of the carriage or the body will then not effect the Bees,

* Mr. Lombard mentions a circumstance which shews the facility with which hives can be moved from the 1st November to the 15th December; and from the 1st February to the end of March. In the month of February, 1812, 105 hives were loaded on a carriage at *Roche-Abeilles*, in the Commune of *Simousin*, in the department *De la Haute Vienne*; they were fifteen days on the road, and after a journey of 100 miles, during which the carriage broke down, they arrived in a good state, excepting four or five, the combs of which were broken, probably owing to the breaking of the carriage. He examined a number of these hives; they were made of osier, of the bell shape, and weighed from forty to ninety pounds. They were buried in straw, topsy-turvy.

and they may be carried to any distance without the least risk.

The hive having reached its destination, is placed in the apiary, and after having allowed it to remain tranquil for about an hour, the sheet may be taken from it, and the entrance opened, but it will be proper to affix the little machine (see Pl. IV. fig. 8.) which is made of tin pierced with small holes, and which is attached to the entrance with putty. This machine is applicable in all instances where it is necessary to confine the Bees, giving them at the same time the requisite quantity of fresh air.

The price of a hive varies much in different parts of England. In the vicinity of London, a swarm cannot be purchased under fifteen shillings or a pound; whereas, in the southern countries, it may be obtained for five or seven shillings. I am certain that it would be a most profitable speculation to purchase the swarms in the southern countries, and convey them to the vicinity of London. There cannot remain a doubt, that within the circumference of ten miles from London, ample food and provision are to be found for 10,000 hives, and I do not suppose that 500 could be mustered.

CHAP. XXVI.

ON THE COUNTRIES MOST BENEFICIALLY SITUATED FOR THE CULTURE OF THE BEE, AND THE NUMBER OF HIVES, WHICH EACH COUNTRY CAN SUPPORT.

IT may be generally considered, that all the countries of the world, in which flowers are produced, are proper for the culture of the Bee; but it must be allowed at the same time, that the southern countries, or those of a temperate climate, are much more favourable to the Bee than the cold and northern ones. In regard to the quantity, and especially to the quality of the honey and wax, the balance is certainly in favour of the south.

The mountainous countries produce in general a richer harvest for the Bees than the flat, because they are drier, and give a better quality to the honey and wax.

In regard to the number of hives, which a given district can support, I cannot exactly coincide in the opinion of M. Lagrenée, (who is certainly one of the most skilful apiarians of the present day) when he says, that every district can maintain an unlimited number, without any inconvenience arising from it. I however agree with that author, that it is not possi-

ble to determine with precision, the number of hives, which this, or that country can support, at least it cannot be so exactly computed, as the number of men which a particular district could or could not maintain.

Yet, however, as there are some districts which, being infinitely more fertile than others, are consequently more able to support a greater or less number of men, so there are certain countries which, although situated under the same climate, are infinitely more fertile in honey and wax; arising either from the abundance, or the quality of the flowers which grow in them; it thence follows that those countries are more or less favourable to the multiplication of Bees, and that some can easily provide for any number of hives, whilst others cannot provide for half the number. One of the axioms of M. Lagrenée is, "*that in a country, as it is certainly proportionate to the number of people which inhabit it, and to the cultivation which they bestow upon it, there will also be a sufficiency of honey and wax to collect.*"

In regard to this assertion, I cannot coincide in it; it being contrary to experience. Nature is limited in all her productions, and every thing has its end; consequently, if in an island, for example, which can support 10,000 persons, 15,000 were to be placed, famine would soon be felt, and if 20,000 were placed, the death and destruction of all the inhabitants would take place, supposing in these three hypotheses that the fertility was the same. By the same parity of reasoning, if in a given extent of territory, which produces only a certain quantity of honey and other provisions necessary for the support of the Bees, a certain number of hives is placed, in proportion to its fertility,

for example 100, they could with facility provide themselves with every necessary, and furnish a proper quantity of honey and wax to the proprietor; but, if this number be doubled, they would not find a sufficiency of food, and consequently, they would yield very little to the master; to which it may be added, that if the season be a bad one, the hives would not be able to preserve themselves. Finally, if in the same district, double the number of Bees are kept than it is in a condition to support, they will necessarily perish, not being able to provide themselves with the food necessary for their support, with the exception, perhaps, of a few hives, the Bees of which, by their number and superior activity, have been able to collect a greater quantity of honey than the weaker ones.

This is a certain rule, when there are few hives in a country, or only those, which can be well supported in it, the Bees find their food, without giving themselves much trouble, because, in the course of the day, they can make from twenty to thirty journies. But when the hives are numerous, and exceed the ordinary and natural fertility of the country, the Bees then find great difficulty in providing themselves with necessaries; they are obliged to take longer flights, consequently take fewer journies, and carry less provision into their hives.

M. Lagrenée supposes that in those countries which in some respects are not the most favourable, and are nevertheless well furnished with Bees, there remains a great quantity of honey and wax, which is annually lost on the leaves and the flowers, from not being collected by the Bees.

I do not deny this position, but it arises from the

negligence of some Bees, who, repelled by the difficulties which they experience in providing themselves with necessaries, do not trouble themselves to extend their flights in search of food; or it may arise from bad weather, or because the honey and wax have actually escaped their researches. The conclusion must not however thence be drawn, that every country can support an unlimited number of hives, and that a too great number cannot be injurious to the success of this species of domestic economy.

M. Lagrenée further adds, in support of his opinion, that in the countries where the number of hives has much increased, no diminution has been observed in their produce. The answer to this is very plain, and it could only have happened, because the number of hives which formerly existed in the country, was not in proportion to its extent and its natural fertility in honey and wax, for if the number of hives exceeds the just proportion which ought to exist, it is evident that this excessive number of hives ought necessarily to prove injurious to the prosperity of the Bees.

M. Lagrenée concludes, that although, without contradiction, there are some countries more proper than others for the cultivation of Bees, they may still be kept in all countries, and that no one ought to neglect providing himself with Bees, whatever may be the soil and the productions of the place which he inhabits.

I will now mention those positions which are most proper and advantageous for the culture of the Bee, and they may be divided into three, the first middling, the second good, and the third excellent. These three positions may be distinguished as yielding three diffe-

rent productions. The corn fields, the meadows, with little rivulets, are what I denominate the middling position.

The proximity of woods—abundance of meadow and arable ground, extensive commons and rivulets form the good position.

The vicinity of meadows of heath, woods, great commons and hills covered with odoriferous herbs, removed from lakes and rivers of a certain breadth, may be denominated the excellent position; the latter will produce four times as much as the first, and will double the second. Although these positions may be considered as the best, there are nevertheless other places, where Bees might be placed to advantage, but not in that number which might be wished. The quality of the country in which a person fixes his apiary should be examined, and he should regulate the number of the hives to the quantity of the food which the district can produce, and not place a hundred hives in a place which can only contain fifty. A highly cultivated country is seldom a good position for Bees; the Bee will pass the luxuriant field of corn to regale on the broom, the furze, and the heath, and for this reason the "heath-covered mountains of Scotia" are more favourable to the cultivation of the Bee than the highly cultivated fields of Norfolk or Bedfordshire. After the hay and clover are cut, and the corn is ripe, the country then presents a desert to the industry of the Bee, a few flowers here and there raise their straggling heads, and if the Bees find a sufficiency wherewith to support themselves exteriorly to the hive, they may think themselves fortunate. The knowledge of the country ought to be a part of the study of the apiarian, for it is ac-

cording to that knowledge that his management of his Bees should be regulated. In a cultivated country, after the harvest has been got in, the occupation of the Bee is gone, and unless the proprietor has it in his power to remove his hives to better pasturage, his profit will be very small, not to speak of the danger which his Bees run of dying with hunger during the winter.

Respecting the number of hives which may be kept in a middling district, I conceive that 100 are perfectly sufficient; 200 in a good one, and four or five hundred in an excellent one. In regard to those provinces which I have mentioned, in which, from their high state of cultivation, the harvest of honey ceases in August, they may still be proper for the culture of the Bee, although not to that extent, in the positions previously quoted.

In concluding this article, I am sorry to say, that from the present degraded state of the culture of the Bee in this country, there is no fear of its being overstocked with hives. The climate of this country is particularly congenial to the multiplication of Bees, but we are either not aware of the profit attending their culture, or some old rooted prejudices are required to be extirpated, before the attention of the agriculturists can be invited to this important branch of rural economy.

CHAP. XXVII.

ON THE DISTANCE WHICH BEES FLY FOR FOOD.

THE solution of the question, of the distance, which a Bee flies for food, is not of that minor importance, which it may appear on the first view, for on it depends the goodness or badness of the position, which a person may select for his apiary. The immediate vicinity of the spot may be wholly destitute of those herbs or flowers, from which the Bees extract their wax and honey, whilst at the distance of a few miles, they may flourish in great abundance. The question then arises, whether the flight of the Bee extends to those fertile fields of pasture, and if not, it will be then necessary to move the Bees nearer to them.

Previously to my giving an account of an experiment, which determines the point, I will briefly notice the opinions of the most celebrated apiarians, and attempt to reconcile their discordancy.

In the Encyclopedia, it is affirmed that it has been discovered by the farina of the stamina of certain plants, that the Bees extend their flight to the distance of four miles. The Abbe della Rocca believes that the Bees can smell the honey four or five miles distant, whilst Doctor Chambers considers it difficult for the Bee to fly a mile.

M. Huber, from a well founded experiment, has discovered, that the rays of the circle which a Bee performs does not extend beyond two miles*, and he advises all apiarians to regulate themselves according to that distance.

In a letter of M. Huber of 1810, he says, that at the epoch of the revolution, he lived at Cour, near Lausanne; on one side was the lake, and on the other vineyards. He soon perceived the disadvantages of his situation. When the orchards of Cour were out of blossom, and the few neighbouring meadows mowed, he perceived that the provisions of the mother hives diminished daily; the labours of his swarms ceased to that degree, that his Bees would have died with hunger in the summer, if he had not supported them, and his apiary, which it had taken him years to collect, was entirely ruined.

Whilst his hives were thus going to ruin at Cour, the Bees of Renan, of Chablière, of the woods of Vaux, Cery, &c. places situated about two miles from Cour, without any lakes, woods, or mountains intervening, lived in the greatest abundance, threw numerous swarms, and filled their hives with wax and honey. If my Bees, says M. Huber, could have cleared the interval, which separated them from the places where they could have found provisions, they would certainly have done it, rather than

* The French as well as the English translator of Huber, have fallen into the same error respecting the distance of the flight of the Bee. Huber describes it to be *half a mile*, but it should be recollected that half a mile in the country of Huber, is equal to nearly two miles in England, and thus an error has been attributed to Huber, which ought to be attributed to his translators.

die of hunger. They did not succeed better at Vevay, although the distance is not quite two miles from Vevay to Hanteville, Chardenne, where the Bees flourished particularly well.

I have frequently conversed with the proprietors of the travelling apiaries in Germany, on the distance of the flight of a Bee, and they in general extend it to the distance of a *stunde*, which is about three English miles and three-quarters; for this reason, when they shift their places of pasture, they generally travel about two *stunden*, or seven or eight miles, and they then consider themselves wholly beyond the range of the former flight of the Bees, at their previous place of pasture. It was however, the universal opinion of those men, who in the practical management of the Bee, are not to be surpassed by the people of any nation, although, in the theoretical department they are greatly deficient, that Bees cannot prosper, which are obligated to fetch their food at a distance of three or four miles; and this does not arise from the impossibility of the Bee to extend its flight to that distance, but as the prosperity of a hive depends on the number of journies which a Bee can make in a day to the fields of its pasture; it follows, that the greater the distance of the food, the fewer the journies will be which the Bees can make, and consequently the quantity of honey is proportionately small, which they amass in the hive.

From my own experience, I am however enabled positively to prove that the Bee can extend its flight to even a greater distance than four miles, and the following fact will verify the assertion.

I once accompanied a party of friends on an excursion to the Isle of Bas, situate at the entrance of the

Firth of Forth, and which is at a much greater distance than four miles from any land. Not a single hive of Bees is kept upon the island: how great then was my astonishment to find a considerable number of Bees busily employed on the heath, and who must have winged their flight across the ocean to collect the honey which the heath of the island contained. What an exquisite sense of smell, and how wonderfully great must be the power of instinct in these little insects, which guides them over even a considerable extent of ocean, in search of their mellifluous treasure.

Bonner, who in his opinions, is a rigid adherent of Schirach, alive to all the excellence of the system of that famous apiarian, and fostering at the same time all his fanciful prejudices, was formerly of the opinion that the flight of a Bee never extended a mile, and as has been observed in the preceding note, the same injustice has been done to Schirach, in the translation of his work, which M. Huber experienced. Schirach determines the flight of a Bee to be about a mile; but it is a German mile, and not an English one, and in proportion to each other, they stand nearly as one to four.

It was however, the above circumstance, which made a convert of Bonner, in regard to the flight of the Bee, and we had it once in contemplation to ascertain whether it was from the Lothians, or the coast of Fife, that the Bees had winged their way to the Isle of Bas. Particular circumstances however prevented us.

I had however, in a short time afterwards, an op-

portunity of ascertaining with some degree of nicety, that the flight of the Bee exceeds two miles.

I once possessed a small apiary in the vicinity of the Siedlaw Hills, which bound Strathmore in Perthshire, to the southward. These hills being covered with heath, I had a great desire to know if my Bees were within range of that rich pasturage, and if not, it was my intention to move my hives to the foot of the hill. To ascertain this important point, I chose a fine and serene day, and about twelve o'clock, when the Bees were in full work, I repaired to the hill, taking with me some flour, and at the same time leaving a person at home, to observe if any Bees entered into the hives covered with that substance. On my arriving at the hills, I found a considerable number of Bees working on the heath, but there being other Bees kept nearer to the hills than mine, I sprinkled every Bee I met with, indiscriminately with flour, and on my return home, I was rejoiced to find that my *friend* had observed a great number of Bees enter the hives covered with flour, and I was then satisfied that my Bees were in full range of that valuable pasture.

In regard to the number of journies which a Bee can make in a day, no positive data can be laid down, as it depends in a great measure on the distance of the food. Some criterion may however be formed, from the following circumstance. I one day visited my hives, when the weather was very cloudy, and the Bees were kept prisoners at home; being detained near the apiary for about an hour, the weather in that time became fine, and the Bees were seen crowding from the hives into the fields. I sprinkled some of the Bees with flour, and taking my watch in my hand, and

observing the exact moment of their departure, I waited until their return. A quarter of an hour elapsed before the first returned, and both its legs were well loaded with farina; it was however, thirty-five minutes before the last returned, but without any farina, I was however convinced, from the shape of the body, that it had been in pursuit of honey, and this circumstance gave me reason to believe, that the Bee, which collects farina, will make many more journeys in a day, than that which collects honey, and perhaps in the proportion of five to two.

I consider the velocity of the flight of a Bee, to be about a mile in three minutes.

CHAP. XXVIII.

THE APIARIAN'S MONTHLY MANUAL, OR DIRECTIONS FOR THE MANAGEMENT OF BEES IN EVERY MONTH OF THE YEAR.

October.

I SHALL begin with this month as I consider it the first in the year of the Bees, it being that, in which the swarms are generally purchased, and the hives are either suffocated or deprived of a part of their honey. The labour of the Bee having now ceased, those hives should be examined, which it is intended to keep as stock hives; they should be first weighed, and their respective weights carefully noted down in a memorandum-book; and to prevent mistakes I always number my hives, and place the weights opposite to the numbers. Having ascertained the weight, and finding a sufficiency to support them through the winter, clean the stool and fasten them down for the winter.

The coverings of the hive must be next examined, and should they have been so faulty as to admit any rain, the opportunity must be taken of a fine day to uncover the hive, that it may dry. A new covering must then be adapted to the hive, making it com-

pletely weather-proof. Wheaten straw is the best material for this purpose. Having contracted the entrance of the hive to about half its original size, the apiarian has now done his duty to his standard hives.

The collection of honey takes place this month. To those who suffocate their Bees, no particular instructions are necessary, but to those who deprive their hives, the following precepts will be found useful.

A very great risk is run of totally ruining a hive, if too much honey and wax be taken from them; the principal art of cultivating these insects consists in making a modest use of the right of sharing their provisions, but at the same time, to indemnify ourselves for this moderation by the use of every means which tend to the multiplication of the Bees. If it be your aim to procure annually a certain quantity of honey and wax, it is better to derive it from a great number of hives, which can undergo the process of deprivation with discretion, than from a small number, from which too great a proportion of their treasures might be extracted.

It is absolutely necessary to leave a sufficient quantity for the support of the hive during the winter, and the proprietor must be regulated in the quantity by the apparent population of the hive; for although in proportion to the severity of the winter, the smaller is the quantity of the provision which is used, yet, there is always a greater or less consumption, the Bees not being in a state of torpor as is represented by many authors.

This month is the most proper for the fabrication of those sirups, which are to serve for the feeding of the weak hives. To one bottle of good sound ale, put one

pound of honey, or three quarters of a pound of sugar, to which add a pinch of common salt; boil the whole to the consistence of a sirup, and after it is cool, bottle it, cork it close, and keep it for use.

November.

In this month the hives must be again visited, in order to ascertain their internal health and weight, and the stools must be cleaned as before. The consumption of the Bees will now be evident, and the difference between the weight of the hive in October, will enable the proprietor to form a clear estimate, if the quantity in the hive be sufficient to maintain the Bees during the winter. If any late swarms have been preserved, particular attention should now be paid to them, and in open weather a little food may be given to them in the manner prescribed in chap. xx.

If it should be found that any of the hives have perished since the preceding visit, and which will sometimes take place, notwithstanding the utmost vigilance of the proprietor, and from causes which cannot be exactly ascertained, let them be removed immediately from the apiary, and placed in a dry situation, carefully wrapped round with a cloth, to prevent the spiders, moths, mice, rats, &c. from gaining access to them. In the ensuing season these hives will be found of great use for the swarms, but should the Bees which have perished belong to an old hive, I would not recommend the preservation of it, as it may contain something noxious to the Bees, which will eventually destroy the swarm, which in the ensuing season may be put into it. I can only recommend in this instance the melting of the combs to obtain the wax;

it may perhaps contain some honey, but this is very doubtful.

The entrance of the hive must now be contracted to the size, so as to admit only one Bee to come out at a time. This is the season when the field-mouse attempts to lodge itself in the hives, and the coverings must be again examined to discover if none have sheltered themselves under it: as in this month some tempestuous weather may be expected, due precaution must be taken, that the hives are firm on their pedestals, and that the straw coverings cannot be deranged by the winds. I once saw six hives out of ten overthrown by the wind, and a heavy snow falling at the time, the whole were destroyed.

This month is the proper season for the practice of the hibernating system, or, of confining the Bees in dark granaries or chambers; but as it is scarcely known in this country, nor is in my opinion either advisable or profitable, this brief mention of it will be sufficient.

December.

THE same attentions are necessary this month as in the two preceding, but should the cold be intense, no operation whatever should be performed on the hives. The motion attending the examination is apt to disunite the Bees, and being caught by the excessive cold, inevitable death is the consequence. If snow be on the ground, close all the entrances of your hives, and open them not until the snow be thawed; as however it sometimes happens that snow remains a long time on the ground, and the confinement of the Bees for such a length of time, might prove de-

trimental from a want of fresh air, it would be advisable in the evening sometimes to open the entrances, and close them again in the morning, or a cloudy day might be selected for the renovation of air in the hives, as there is no danger of the Bees leaving them, but the bright reflection of the snow is very apt to allure them abroad, when they fall upon it and die. The safest method is however to fix the machine (pl. IV. fig. 8.) to the hives, which prevents their departure from the hive, at the same time furnishing them with a constant succession of fresh air. In the winter months a great number of hives are destroyed by the imprudence of the proprietor, in allowing the Bees free egress from the hives; their flight should be positively prohibited, or only permitted on those days when the sun shines bright, and there is no snow on the ground.

The feeding of Bees during the cold of December, ought to be carefully avoided; the Bees consume very little, and grouped together at the top of the hive, they appear almost in a state of torpor; should there however be any very weak hives in the apiary, select a mild and dry day for the purpose of feeding, and be not niggardly in the quantity; it is better to give a sufficiency at one time, than to disturb them often by giving them food in driblets.

Examine the covers:—spiders, moths, mice, &c. now shelter themselves under them from the inclemency of the season, and the mice will by degrees perforate the straw, and gain the interior of the hive.

Place the sirup made in October, in a warm situation, otherwise the cold will candy it, which will render it useless to the Bees.

January.

THE processes of this month are so exactly similar to those of the preceding, that it would be merely a repetition to recite them.—At the latter end of it however, the air becomes more humid, and it is certain, that fewer hives perish by the cold than by the humidity, which negligence has permitted to penetrate into them. Many persons allow the snow to remain on their hives from a false notion, that, it tends to keep them warm. A little reflection would however, teach those persons, that there is nothing so penetrating as dissolved snow; and I here particularly enforce the precept, never to suffer the snow to melt on the hives, but to brush it off every day as it falls. Were it to rain on a hive for a week, it would not do it so much injury, as to permit one day's fall of snow gradually to melt upon it.

A due circulation of air is now actually necessary to the health of the Bees, and it will tend much to their preservation if the hive be gently raised on some small supporters, and suffered to remain in that situation during the night. The air however must be dry, when this operation is performed, and the humid air in the hive will then escape: this advice is particularly salutary to those who still use the common straw hive. There being no vent at the top for the foul air, it must be dispersed by the admission of fresh air at the bottom.

By these little precautions, which are more minute than troublesome or difficult, the prosperity and health of the Bees are preserved.

February.

THE season now approaches for the labour of the Bee, and the attention of the apiarian should be particularly directed to the exact state of food in his respective hives. With the return of spring, returns also the vigour of the Bee, and the quantity of food which is consumed in a hive, is now treble to that which was consumed in the winter months. The country as yet offers no food to the Bee, it must therefore be supplied by the bounty of the proprietor.—A liberal distribution of food at this season, will amply repay the trifling expence and the trouble of the apiarian; even to those hives which appear to possess a superfluity of food, an additional donation will prove of essential benefit.

Enlarge the entrance of your hives a little, the Bees in mid-day will now take their flight, which is an infallible sign of their health, and a contracted entrance prevents a certain number from coming out, which is very detrimental.

It is towards the latter end of February, or the beginning of March, that the dysentery in general shews itself, and the vigilance of the proprietor is now necessary to prevent or to cure it. Let him not however mistake the excrement of the Bees for the dysentery; for there are some apiarians who are so fully rivetted to the opinion, that the Bees void no fæces, that in the spring when the Bees take their periodical flight, and little yellowish globules of fetid liquid are seen on the stool of the hive, and on the clothes of the person who stands near it, they immediately declare their hives in an infected state, and would if possible

place every Bee under quarantine. This malady has however been treated on so fully in chapter viii. that no instructions are here necessary for either its cure or prevention. Cleanliness is the ground-work of the health of the Bees,—therefore in this month clean all your stools well from the accumulated filth of the winter.

This is a good season for the purchase of hives,—they have now weathered the dangers of the winter, and with the donation of some food, even the weakest hive will succeed.

If the proprietor has confined his hives during the winter, they may now be moved into the garden, but this operation must be performed on a mild and serene day; for the Bees feeling the influence of the air, will make every exertion to taste the sweets of liberty, and should the weather not be fine, the death of many of them will be the consequence.

The crocus appears this month,—the Bee rouses itself from its lethargy, and the hive soon becomes the scene of labour and activity.

March.

THE proprietor may now divest himself of all fears of famine. The genial warmth of spring has called vegetation into activity, and the gardens and the fields now yield abundance of food for the Bees.

Clean the apiary throughout, and if it be not in the immediate vicinity of water, it must be procured for the Bees without delay. It is in the spring that the Bees have the greatest occasion for water, and should it not be provided for them by nature, nor by the care of the proprietor, he will soon discover the total de-

cline of his hives. In order to supply them with water, the following plan may be adopted. Three or four troughs either of stone or wood, the latter well pitched, of eight or ten inches in depth, may be sunk in the earth, into which some mould may be put, and then filled with clear water. (Rain or river water is to be preferred.) In each of the troughs, three or four sprigs of water-cresses must be planted. These cresses will soon cover the troughs: their vegetation will preserve the purity of the water, and the Bees will soon make it their drinking place; for it is a curious fact, that Bees in those favourable situations where a small rivulet runs near the apiary, always select one particular spot, whither they go to drink; and it is in general where the water is shallow, and a number of small stones project above the water on which they can alight to drink. The troughs in summer should be kept constantly supplied, for the absorption of the sun will soon dry them. The cresses may be picked and eaten, without which they will become too luxuriant, and the Bees will not be able to penetrate to the water.

If there be any very heavy and full hives in the apiary, I now recommend to the proprietor to give them an eek of about four bands; although the diminution of a hive is very proper at certain seasons of the year, and especially in autumn, yet in the spring, a moderate enlargement of it will be found of particular benefit, as it frequently happens, that the queen has not a sufficient number of cells in which to lay her eggs, and the population of the hive is thereby impeded. It must be understood that I am now speaking of the common straw hive. To those who use the

storifying method, an additional story at this season will be found beneficial.

As one great advantage towards the preservation of a hive, is the renovation of the combs, I invariably at this season, extract from the hives which I use, a part of the combs of the preceding year. The form of my hives offers me considerable facility in this operation; I can at one view discover the combs grown brown with age, and especially those combs in the middle of the hive, which are known to be the breeding ones. Should any of those combs not contain brood nor eggs of the preceding season, I cut a part of them out, but this must be done with great care and moderation. I am not at all afraid of the queen being impeded in laying her eggs, for the Bees will soon replenish the vacuum, perhaps in the space of forty-eight hours.

As the weather in this month is often very variable and cold, and the Bees are kept confined for several days, and sometimes weeks, consequently unable to collect any food in the fields, and as the population has increased, the proprietor should not neglect his weak hives, but give them some little food in the evening, remembering to take away the plate on the following morning, for as it might happen that the weather would enable the Bees to resume their labours, the Bees of the strong hives might scent the food administered to the weak ones, and a system of robbery would commence, which might prove totally destructive of the latter.

The full entrance may now be restored to the Bees, but not until the close of the month.

April.

At the beginning of this month some traces of the dysentery very often exhibit themselves, and especially if the Bees have not had that attention paid to them which is too often the case with the Bee-masters of this country. Under these circumstances, a sirup should be immediately given to the Bees, in which a small quantity of salt has been mixed, but rather in greater proportion than in the fabrication of the sirup mentioned in the month of October.—Clean the stool every two or three days, and sprinkle it with a little salt. The malady will soon cease if taken in proper time,—but I know no cure for it when it has reached its crisis.

The butterfly of the moth, that redoubtable enemy of the Bee, appears in this month and continues until October. Destroy them as much as possible; frighten not away the bats which fly about the hives, as they devour a great number of them.

The season of the swarms approaching, the provident apiarian will supply himself with new hives ready to receive them. He ought in general to provide himself with double the number of his hives, but their dimensions ought to be different. Those intended for the second swarms ought to be one quarter less than those intended for the first. Having purchased the requisite number, proceed to divest their interior of all projecting straws, or other objects which will impede the labour of the Bee,—set them apart ready for use in a dry place.

Towards the middle or the end of this month, watch for the appearance of the drones. Having as-

certained their existence, keep a watchful eye upon that hive,—in ten or fourteen days a swarm may be expected.

Considerable robberies take place this month amongst the Bees. The utmost vigilance is necessary on the part of the proprietor to discover if any of his hives are attacked; should he find this to be the case, follow the instructions given in chapter xxiii.

Artificial swarms may be made at the end of this month, but not until the existence of drones in the hive has been completely ascertained.

Keep a vigilant eye on the Queen Wasp, which is now to be seen in the gardens: the destruction of a single one, deprives the Bees of a host of enemies.

Should any hive appear to be inactive, fail not to examine it,—the cause may be ascertained in time to apply the remedy, but delay will prove the destruction of the hive.

May.

This is one of the busiest months in the year for the apiarian. If his Bees lie out in clusters, and present the other signs of swarming, let him watch from ten in the morning until three P. M. Artificial swarms may now be made with certainty of success. This is also the season for the transversion of hives, which must be effected immediately, after the first swarm has departed.

The apiary must now be kept particularly clean, vermin now abound, and a little attention on the part of the proprietor, will save perhaps many of his hives towards the latter part of the year. No danger of famine now exists, but particular attention must be paid

to resist the depredations of the different enemies, which at this time begin their attack.

June.

In this country swarms may still be expected, and sometimes towards the latter part, a virgin swarm may be obtained.

The business in the apiary this month is chiefly confined to the swarms. The proprietors who still make use of the common straw hive, will do well to add an eek or skip to each of his hives, for the honey season is now fast approaching, and the Bees will soon fill the combs.

Persons wishing to establish an apiary, should purchase the first swarms of this month; if possible they should be purchased within a mile or two miles at furthest of the intended apiary; move them on the evening of the day on which they have swarmed.

The hives, the Bees of which have perished in the spring, should be now exposed to the influence of the sun. In this month I first obtained the discovery of the re-establishment of a perished hive, and I would advise every proprietor on being convinced of the existence of eggs in the cells to follow the advice now given.

If the weather prove rainy on the days subsequently to the hiving of the swarms, omit not to give them a little food, carefully keeping in view the instructions given in the chapter on the Feeding of Bees, second swarms should be particularly attended to.

July.

The honey harvest is now commencing in its full

vigour; the swarming season is over, and the attention of the apiarian must now be solely directed to ascertaining if his Bees are within the range of the pastures of honey; if not, they should be removed.

The influence of the sun is now great; shade your hives in the mid-day, especially the swarms, as the newness of the combs are more apt to be melted by the heat. More hives destroyed by heat than cold.

The swarms having departed, this is the proper season for the deprivation of the hives, as sufficient time will be then given to the Bees to replenish the vacuum. Moderation to be observed in the deprivation.

The deprivated hives to be removed with all possible speed to the vicinity of buck-wheat or heath.

Look for wasps nests,—and destroy them as described, chap. vii.

In this month the virgin swarms are cast; they are however so very rare, and in all cases ought to be so particularly prevented, that no instruction for their preservation are necessary. Should one however be thrown, join it to a weak second swarm, or to its mother hive.

It is generally from this month to October, that a hive shews the strongest symptoms of approaching decay. The following are some of the most striking signs. First, when few Bees are seen to enter the hive with the load on their thighs. Secondly, when at the hour of exercise which the Bees take in fine weather from twelve o'clock to three, the Bees of any par-

ticular hive remain tranquil. Thirdly, when on turning them up to examine them, the Bees shew no signs of anger. Fourthly, when ants and other strange insects are seen to enter the hive without opposition. Fifthly, when the food which has been given to them, has not been deposited in the cells. These signs announce the death of the queen, or that she is incapable of further peopling the hive,—or that there is no brood,—or that the moth has carried its depredations so far as to render the hive untenantable. The proper steps to be taken under these circumstances have been already detailed.

August.

THE proprietor is now looking forward to his harvest. In this month the Bees collect a prodigious quantity of honey. The second vegetation of the trees has taken place, and their transudation offers to our insects a vast store of food.

The middle of this month is not too late to deprive the hives of a part of their honey, provided it be intended to remove them afterwards to the vicinity of heath. Be careful to weigh the hives previously to the operation; do not meddle with a hive that does not weigh thirty pounds.

Determine this month on the hives which you intend to keep as stocks, and to these hives particular attention must be paid, to observe if the necessary signs are shewn which indicate a healthy and populous hive.

The pillage of the hives by stranger Bees often takes place in this month. The remedy for this disaster has been already given.

Towards the close of the month prepare the utensils necessary for the final deprivation of the hives, and the manipulation of the wax and honey.

The part of the proprietor is chiefly this month passive: a regular survey must be taken of the hives, and if they be found in a full state of labour, and present other signs of heath, which have been already described, the less they are disturbed the better.

September.

By the beginning of this month the humane apiarian will ascertain if any of his neighbours intend to suffocate their bees. I invariably adhere to the custom of purchasing these unfortunate victims, and I have always found my account in it by adding them to my other hives.

The time is now arrived when all the useless mouths are discarded from the hive; the drones are now killed, and the honey season draws to its close.

Remove your stock hives to better pasture.—The heath now in bloom.—This is the proper season for founding an apiary, by purchasing the swarms of the current year, the directions for which have been already given.

Observe those hives particularly which do not kill their drones,—some radical defect exists, and if suffered to pass without discovery, the ruin of the hive may ensue.

Examine well the exterior of your hives, a new covering should now be given them, made of the straw of the present harvest; this will stand the winter.

If the attack of the wasp is perceived to be formidable, which frequently occurs in this month, let the entrance to the hives be contracted, or let them be removed to a distant pasture, and especially as the heath still continues in bloom.

The stools of the hives should be cleaned this month, especially those of the stock hives.

CHAP. XXIX.

LIST OF TREES, PLANTS AND FLOWERS, FROM WHICH THE BEES EXTRACT THEIR HONEY AND WAX.

APPLE.—The blossom of this tree is eagerly sought after by the Bees.

Arbutus.—This is a small shrub, which preserves its leaves, and produces rather an oval fruit, of a yellowish red colour.

Apricot.—The blossom of this tree is much frequented by the Bees.

Ash.—The flower of this tree is rich in farina.

Almond.—This tree blossoms early, and emits a smell similar to honey; the Bees extract a copious harvest from it.

Althea frutex.—Flowers in May, and continues in bloom for three months.

Amaranth.

Aspin.—The Bees gather a great quantity of provision from the buds of this tree. The resinous or gummy matter, with which they are covered, is very tenacious, and of a brown colour. From this tree, it is supposed that the Bees fabricate their propolis.

Balm.—Much frequented by Bees.

Blackberry.—Of great value to Bees both in honey and farina.

Burrage.—This may be called the king of plants for the Bees. It produces many flowers, and continues in bloom for several months, during which time the Bees appear actually to swarm upon them. This plant should be particularly cultivated by every apiarian.

Betony.—The produce of this plant is supposed to give a bitter taste to the honey, although Gallo considers it as the most perfect of all herbs.

Lox.—The flowers of this shrub yield a considerable quantity of farina.

Beans.—Every species of this pulse yields a considerable harvest to the Bee. The common horse bean, the kidney, and the scarlet runner, are the most prolific in honey.

Buck-wheat.—Bees cannot fail to thrive where this grain is cultivated. Its culture however in England is very confined, but on the Continent, where it is more extensive, the quantity of honey amassed by the Bees is very considerable.

Broom.—This is a most valuable shrub for the Bees. It blossoms early, and excepting the furze, there is no plant from which a greater quantity of farina is extracted.

Burnet.—Very prolific in honey.

Cabbages, Cauliflowers, and every species of these vegetables, are much sought after by the Bees.

Cherry.—Few trees present greater gratification to the Bees than the Cherry, the flowers yield a profusion of honey, and M. Contardi asserts that a single flower contains a sufficiency to fill the bladder of the Bee. This may take place in the country of which

M. Contardi was a native (Italy) ; but this fecundity of honey certainly does not exist in this country.

Clover.—The common white clover, generally known by the appellation of cow-grass, is, on account of the shortness of its chalice, the particular choice of the Bees ; the red clover is very prolific in honey, and affords excellent pasturage for them. In the Levant the flower of the clover is yellow. The white clover, or cow-grass, growing spontaneously, is invaluable to the apiarian.

Chestnut and *Horse Chestnut* are both rich in farina. In the vicinity of Arundel, where the former is in great abundance, the Bees thrive uncommonly.

Currants.—The early flowering of this fruit, and the extraordinary quantity of honey which it contains, renders the culture of it particularly desirable in the vicinity of the apiary.

Cypress,—like the Box, yields a considerable quantity of farina.

Dandelion.---This flower is much frequented by the Bees.

Endive.—In flower, valuable to Bees.

Elm.---During the time of the flowering of this tree, the Bees obtain a precious harvest, and as it flowers early, it is very desirable in the vicinity of an apiary.

Elder.---The Abbe della Rocca says, that he never saw a Bee alight on the flowers of the elder. I believe that very little honey is extracted from it ; but I have been too often an eye-witness of the particular attention which the Bees pay to the flower of the elder, to doubt that a considerable quantity of farina is obtained from it.

Furze.—The early blowing of this shrub, renders it highly valuable in the vicinity of an apiary. Its fecundity in farina is surpassed by very few of the plants, from which the Bees extract their materials for wax. The absence of this plant is one reason why a highly cultivated country is not beneficial to the culture of Bees. But why might not the hedges be constructed of it? As a defence and boundary it is certainly unquestionably good, nor would the proprietor or farmer be injured by its adoption. In a season of scarcity of fodder, it has been found an excellent substitute, and as fuel, it is now used in some counties of England by the poorer classes.

Gooseberry.—The blossom of this fruit possesses the same good qualities as the currant. It is even richer in honey, and generally forms the first source from which the Bees extract their honey in the spring.

Golden-Rod.—As this flower blooms only about Michaelmas, it is very valuable to Bees. Some of the German apiarians consider the honey of this plant to be of a deleterious nature. I inquired of the keeper of one of the Hanoverian Bee-caravans, his grounds for believing in the injurious effects of the golden-rod, and his only reason was, that his mother told him so. I should have anticipated this answer from nine-tenths of the keepers of Bees in England; but coming from a German apiarian, it furnished me with another proof, that knowledge and practice are not always combined.

Gourds, Melons, Cucumbers, all supply Bees with food.

Hawthorn ; black and white, both equally advantageous.

Heath.—It is impossible to describe the value of heath in the collection of honey. It is very possible, and it is even certain, that Bees will thrive without it; but its vicinity to the apiary is a great acquisition.

Hyacinths (single) yield a little produce ; but it is too trifling to encourage their culture.

Iris Jonquil.—A considerable quantity of honey is extracted from the flower of this plant.

Lucerne.—This is a valuable pasturage for the Bees, and especially as it is cropped a second time, which brings the flowering late.

Lavender.—The honey extracted from this plant is supposed to possess an aromatic flavour, and it is asserted that the flavour which the Sicilian honey possesses is to be ascribed to the lavender with which the island abounds.

Laurel.—This shrub is particularly valuable, as during the sultry weather its leaves are always covered with the honey-dew. Its flowers also abound with farina.

Lily.—Almost every species of this flower yields an abundant harvest to the Bees. It is however singular, that the common white lily, which abounds so much with farina, appears to be almost wholly rejected by them.

Lemon-tree.—This is a luxurious tree for the Bees. No great advantage can, however, be expected to be derived from it in this country, as the climate is not congenial with its growth. The same rule holds good with the orange-tree.

Mignionette.—Of all cultivated flowers, this is the

richest in honey. Its cultivation ought to be particularly attended to.

Melilot.—(*Trifolium melitotus officinialis*). This plant is biennial, and grows in the hedges and thickets. It produces a great quantity of honey, and the Bees are very eager in their search for it. It blows in the months of July and August, and is in some respects superior to the buckwheat, as the honey extracted from it is supposed to be of a high flavour.

Mustard.—(Wild and cultivated)—of the former the Bees are particularly avaricious, and the difficulty with which it is eradicated from the ground, gives great reason to suppose that this food of the Bee will never be exhausted.

Marsh mallows.—Rich in farina.

The following may be considered as providing abundance of food for Bees, and the cultivation of which ought to be encouraged.

Oak.

Parsley.

Pear Tree.

Parsnip (in flower.)

Poppy.

Primrose.—This flower is quoted by some French apiarians as yielding honey, but I never saw a Bee alight upon it.

Plumb Trees of all species.

Rosemary.—This shrub is particularly rich in honey, and it gives to it a very pleasant flavour.

Radishes.

Raspberry.

Strawberry, particularly the Alpine.

Sage.
Savory.
Saffron.
Sainfoin.
Sun flower.
Single roses of all kinds.

Turnips.—The flower of this root is very rich in farina, and eagerly sought after by the Bees.

Thyme.—(Wild and cultivated) invaluable to Bees.

Willow.
Wild marjoram.
Vetches.
Violets (single.)
All resinous trees.

In the list of these plants and flowers, the golden-rod must be particularly noticed, as it begins to flower when all the other flowers have faded, and continues in bloom until the middle of November. This flower is always covered with Bees, during the last months of the summer, and the two first of autumn, provided the weather will permit the Bees at that season of the year to leave the hive. This plant should be particularly cultivated in the vicinity of an apiary. It will grow in the worst of soils, and an acre of unarable land planted with the golden-rod, would furnish at the close of the season a sufficiency for a hundred hives to complete their winter stock.

In general, all those plants ought to be cultivated which begin to blow in February and March, and those which keep flowering to the close of the season. The Bees, always active and laborious, turn to advantage with the same ardour, the last as well as the first

moments of vegetation, and the flowering of the plants.

All vegetables contain more or less the principles of honey, only in a greater or less degree. Consequently, the Bees can maintain themselves every where, and gather a stock of honey proportionate to the abundance which is offered to them in the country which they occupy. It is, however, the rich and vast meadows well studded with flowers, in which the useless daisy is not seen, the fields whitened with buckwheat, the plains gilded with the flower of the wild mustard, the turnip and the cabbage, and the forests of oak, ash, elm, &c., that present to the Bees a daily supply of excellent food, and an abundance of provisions, wherewith to fill their magazines.

I am, however, sorry to be obliged to notice, that in the present state of the culture of the Bees in this country, there is no reason to fear a scarcity of food for that valuable insect. Taking England and Scotland on an average, it is certain that there is not one hive to ten square miles, whereas one square mile would support 100 hives.

It is difficult to believe, that there are so many plants prejudicial to Bees, as it is asserted by several authors: If there be any, which might give a pernicious effect to the honey, it would perhaps be our narcotic plants, such as the henbane, hemlock and others; but from my individual experience, I am not able to decide this question.

The Abbé della Rocca mentions but one flower, which is known in the Archipelago, as giving a bitter taste to the honey, and this is the flower of a particular species of large onion, known by the name of *Turcaki*,

but it was never found to be injurious to the Bees, nor to the health of man. It is true, that of this species of honey, which the Bees collect in the month of October, no other use is made than for domestic purposes; it is generally left for the consumption of the Bees.

M. Buch'oz mentions several flowers which are injurious to the Bees, namely, the elm, narcissus, elder, lime, and some others. In regard to the latter, it appears to be decided, that this tree, so far from being injurious to the Bees, is wholly the reverse, for it is particularly beneficial to them. In regard to the other flowers, I do not believe that their injurious qualities are so completely demonstrated, as the above author pretends.* To verify the fact, some pieces of the comb ought to be extracted from the hive during the season, when the above plants and flowers are in bloom, and it should be analyzed, in order to discover if it was compounded differently from the common honey of the country collected in another season.

It may however happen, that the honey of certain countries may possess noxious qualities. Tournefort relates in his Travels in the Levant, some interesting facts on this subject. He says, the *chamærododendron* is a small shrub which grows in the environs of Trebisonde, and which bears a cluster of more than twenty flowers of the greatest beauty. This plant is partial to a humid and fat earth, and is considered unwholesome. The cattle never eat it, unless driven to it by hunger. The inhabitants of Trebisonde, from an ancient tradition, founded no doubt on some parti-

* The German apiarians conceive, that the honey or farina collected from the fields which have been manured with gypsum is very prejudicial to the health of the Bees.

cular observations, assert, that the honey extracted from it by the Bees, stupifies those who eat of it, and causes violent retchings.

Dioscorides speaks of this honey nearly in the same terms: "In the vicinity of Heraclius, on the Black Sea," he says, "at a certain time of the year, the honey stupefies those who eat of it, and it is certainly owing to the properties of the flowers from which it is extracted; they perspire profusely, but the vomiting is cured by rue, saline draughts and mead. This honey is tart, and causes a sneezing. It takes away the freckles on the face. If it be mixed with salt and aloes, it effaces the blackness occasioned by bruises. If dogs or pigs swallow the excrements of persons who have eaten of this honey, the same casualties befal them."

Pliny has better illustrated the history of this *Chamærododendron* than either Dioscorides or Aristotle. It was the belief of the latter, that the Bees collected this injurious honey on the box, which rendered those silly who ate of it, and who were previously in good health. Pliny thus speaks of it. There are certain years in which the honey is very dangerous in the vicinity of Heraclius, on the Euxine. The authors are not of accord from what flowers the Bees extract it. All the information which I am enabled to give on the subject is, there is a plant in this country called *aegholethron*, the flowers of which, in a wet spring acquire a very dangerous quality when they fade. The honey, which the Bees extract from them, is more liquid than ordinary, much heavier, and of a reddish hue. Its odour excites sneezing; they who eat it perspire profusely, and lie down on the ground. He afterwards

adds the same remarks as Dioscorides, whose words he appears to have copied.

Pliny continues. There is another sort of honey on the shores of the Euxine, which is called *mænomenon*, because it renders those persons senseless who eat of it. It is supposed that the Bees collect it from the flowers of the rhododendron, which is universally found in the woods. The people of this country, although they paid a part of their tribute to the Romans in wax, took particular care not to give them any of their honey.

When the army of 10,000 Greeks approached Trebisonde, a singular accident befel them, and which raised a great consternation amongst the troops, and it is related by Xenophon, who was one of the principal chiefs. That author says that, as the number of Bee hives was considerable, the soldiers ate a great quantity of the honey; they were all seized with vomiting and purging, followed by vertigo: so much so, that those who were the least afflicted resembled intoxicated persons, and others appeared like madmen in a dying state. The ground was covered with bodies, as if a battle had taken place; not an individual however died, and the malady ceased on the following day about the same time as it commenced; on the third day, the soldiers were in that weakened state, which a person experiences after having taken a strong medicine. Diodorus of Sicily relates the same fact, under similar circumstances. There is every reason to suppose that the honey was extracted from the flowers of some species of the chamærododendron. The environs of Trebisonde are full of it, and Father Lambert, a missionary, acknowledges, that the honey

which the Bees extract from a certain shrub, in Colchis and Mingrelia, is dangerous, and causes vomiting. He calls this shrub *oleandro giallo*.

Although the above detail carries with it a positive degree of interest, yet my aim in describing it has not been solely limited to the desire of establishing the point of a species of honey being injurious to the health; but, I had also in view, a direct refutation of the opinion of certain apiarians, (an opinion which is very prevalent in France) that honey is a fabrication of the Bee, and does not exist *per se* in the chalice of the flower. If the former were the case, there could be no such thing in existence as an injurious honey, for the produce of the Bee would be the same in all countries; but if under any particular circumstances, deleterious honey should be produced, it must be ascribed to some cause not dependent on the Bee, and this cause can be no other, than particular flowers from which the Bee extracted its honey, and which undergoing no process in its stomach is deposited in its natural state in the cell.

CHAP. XXX.

ON THE DIFFERENT SPECIES OF BEES, IN VARIOUS PARTS OF THE WORLD.

THE description of the European Bee has been already given; it is however remarkable, that this insect differs in various countries, not only in its nature, but its economy. Dapper in his description of Abyssinia, says, that there are great numbers of Bees in Ethiopia, especially little black Bees, which make an excellent honey, and a wax of an extraordinary whiteness. These Bees having no sting, have recourse to artifice to defend and preserve themselves; they conceal themselves in subterranean cavities, which they enter by little holes, which they have the address to close as soon as any one appears; they place themselves four or five at the hole, and adjust their heads so skilfully, that being on a level with the earth, they cannot be discovered.

On the east coast of Africa, there is no district which is not peopled with Bees; the trade with wax is carried on to a great extent amongst the negroes: the Bees of Guinea produce excellent wax and delicious honey. Still they are not domiciliated, as in this country; they are wholly wild, of a small size and black colour, and nature has so wisely ordered it, that where the inhabitants are naked, the Bees should be bereft of stings.

Knock, in his account of Ceylon, distinguishes three sorts of Bees; the first resembles those of Europe, and lodge themselves in hollow trees. The Indians easily extract the honey, after having driven out the Bees, the stings of which are not an object of fear. The second species fixes itself on the highest branches, where they form their nests, without taking any pains to conceal them. In certain seasons, the towns are depopulated, as the inhabitants repair to the woods in search of this honey, with which they all return loaded. The third species is smaller than our common flies; they produce honey in such abundance, that the Chyngrelians make it a part of the nourishment of their children.

In China the number of Bees is immense, but of their culture, the Chinese appear to be very ignorant. The wax is merely used in medicinal cases, but never for tapers or other domestic uses.

In Muscovy and the Indies, a black wax is found sometimes in the trunks of old trees, and which is formed in small round or oval pieces, of the size of a nutmeg. It is made by little Bees, which construct their cells in the hollows of the branches and trunks, and which contain a honey of a citron colour, and an agreeable taste. This wax being heated, has the smell of balm.

The Bees of Guadaloupe, and of all the other West India Islands, are in size fully half as small as those of Europe: they are blacker and rounder. It does not appear that they have any sting, or if they have, it must be so very weak as not to pierce the skin. They are perfectly wild in the woods, and they lodge

themselves in hollow trees to construct their works. If the space be too great, they make a sort of a dome of wax, which has the figure of a pear, in the middle of which they fix themselves, and make their honey and rear their young. Their wax is of a deep violet, soft to the touch and stretching easily between the fingers. Various attempts have been made to change the colour of the wax, but without effect; and owing to its softness, the natives have never been able to make tapers or candles of it. It is used in the country for making stopples to bottles, or taking the impressions of engraved stones. The monks of New Spain and of the coast of Carac make tapers of it, in order that the light may be feeble and melancholy. The natives of the Caribbees form a species of mastich with it, which they call *many*, and which they apply to different purposes.

These Bees form no combs; they enclose their honey in small waxen cells, of the figure and magnitude of a pigeon's egg, but more pointed, and resembling the bladder of a carp. Although they are easily separated from each other, there appears no vacuum between them. The greatest part of these cells or bladders is filled with honey; in a few, a yellow matter is found granulated like the spawn of fish. The negroes call it the excrement of the Bees*. This honey is always liquid, having the consistence of the oil of olives, and of an amber colour. It grows sour in a very short time. The Creoles extract it from the trees, and eat it with great

* If we may judge by analogy, this may be our bee bread or crude wax, for the purpose of feeding the young Bees.

avidity. The apothecaries apply it to the same use as in Europe. A considerable quantity of this honey would be obtained if the Bees were lodged in hives, but in these countries, not the slightest notion exists of that method of keeping Bees. It was however once tried by P. Labat, who kept them in the sugar moulds and in the refining houses, in which the Bees worked well; still however, the plan was not acted upon, as the hives were destroyed by the ants, and the secret had not been discovered of preventing the inroads of those vermin.

The wax of this species of Bees is, according to the experience of P. Labat, an excellent remedy for corns on the feet, and warts on the hands.

The Bees of Louisiana resemble those of Europe more than any foreign Bees; they make their nests in the ground in dry places, by these means they protect themselves from the bears, who are very voracious of their honey.

Bees are very plentiful in the Hottentot country*; but the Europeans do not give themselves the trouble to rear them, because for a little tobacco, brandy or some bagatelle, a considerable quantity of honey may

* In Campbell's Travels in South Africa, he says, speaking of the Bees in the vicinity of Hardcastle in the Namagua land, the Bushmen over the whole country lay claim to all the honey in the Abestos mountains as their property. They mark the hives in the rocks, as farmers mark their sheep, and should they find in their regular visits, that any hive has been robbed, they are sure to carry off the first cow or sheep they meet. They say that *Corannas*, *Matchappees* and *Morolongs* have cows and sheep that live upon the grass of the land; that they have none, therefore they have a right to the Bees, who live only on the flowers. Their right is not invaded, because all find it their interest to let the Bushmen obtain the honey, and then to purchase it of them.

be purchased from the Hottentots, which they go in search of amongst the steep rocks; but the honey is very dirty, as it is put into skins, the fur of which is in the inside. In the Archipelago, and in all parts of Greece, the skins of kids are used for the transportation of honey, and although the skins are turned inside the honey is nevertheless very clean.

The method practised in Spain of discovering the nests of wild Bees is very ingenious. In the Complete Treatise of Agriculture of Alphonso de Hernera, printed at Madrid in 1645, the following very natural method of collecting wild Bees is mentioned, although it is only suitable for those countries or districts, in which there are no hives, because the domestic Bees, multiplying in the ordinary manner, are infinitely superior to the others.

In Spain, it is the sole occupation of certain individuals to collect the wild Bees, for which purpose, they place a little honey on a stone, on the brink of the nearest rivulet. The honey is no sooner deposited than the Bees come in crowds to collect it. They are then sprinkled with red ochre diluted in water, and the great heat which prevails in that country, soon dries the colour, and the Bees remain marked. They may be then watched with the eye to their retreat. If it be very distant, which is often the case, another expedient is used which is equally simple and ingenious.

One of the great reeds is taken, which are so common in Spain, Italy, and the southern parts of France, and it is cut into small tubes, open at one end and closed at the other. They are afterwards smeared with honey, or they are left for some time to soak in

honey water. These traps are placed at the edge of a river or spring, and they are immediately visited by the Bees. As soon as it is supposed that a sufficient number have entered the tubes, the opening is closed with the finger, and the Bees are kept prisoners. One is suffered to escape, which is followed with the greatest care, and as soon as the view of it is lost, another is let loose, which is followed like the former. This method cannot fail of success, as a Bee always returns to its domicile. When the nest has been discovered, the branch is cut to which the Bees have attached themselves, or they are driven from their retreat by smoke. They are then put into a hive perfumed with thyme and other odoriferous herbs, and are kept in the ordinary manner. In swarming time, they place perfumed hives at certain intervals in the mountains, whither the swarms generally repair, and they are thus lost to the real owner, as the law of Spain makes those swarms the property of those who deposited the hives.

The only difficulty in this method is, that the Bees imprisoned in the tubes may all belong to different nests, and thus the pursuers may be baffled in their design. Success however generally attends the operation.

In North America, the Bees generally lodge themselves in hollow trees, and the honey which is there collected is superior to the best honey of Europe. Combs have there been found eighteen feet long, and it is to the bear that they are indebted for the discovery of the mellifluous treasure. The bear possessing a most acute sense of smell, is not long in discovering the abode of the Bees; but he sometimes spends several days

in his trials to obtain the honey. The people of the country know well, when a bear rubs himself against the tree, that they are certain of finding honey. In this respect the Bear acts the part of a pointer to the game, and he shares the same fate, in regard to the quantity which he obtains of the treasure which he has discovered.

CHAP. XXXI.

METHOD OF INCREASING THE CULTURE OF THE BEE, BY THE FORMATION OF AN APIARIAN SOCIETY.

As the opinion of several authors disagree respecting the decline in the culture of Bees, there must necessarily exist a difference in the means proposed for its remedy. Excepting the premiums offered by the agricultural societies of this kingdom,* there is no positive encouragement for individuals to undertake the foundation of an apiary. I allow that the management of Bees is attended with some difficulty, and I may add some danger, for it is the fear of the stings of these little insects which discourages many persons from keeping Bees. The art of managing Bees is, however, but little known in this country; in some countries, and particularly Germany, it is actually made a part of education, and certain persons are appointed and paid by the government for instructing the peasants in the cultivation of Bees. It is not only

* In July 1801, the Dublin Society adjudged premiums at the rate of ten shillings per stock, over ten stocks preserved during the winter to six persons for preserving 128 stocks, since last summer, in the counties of Waterford, Tipperary, Louth, and the King's County.

theoretically but practically taught, and for this purpose, gardens are kept for the sole purpose of containing Bee-hives for the instruction of the peasants. Thus in Vienna, a Bee-master has been appointed, whose name is Pösl, who has a garden containing 100 hives, which is provided with every implement and improvement necessary for the elucidation of the practical management of Bees. Particular days are specified in which public lectures are held in this garden, and it is generally frequented by young men, intended for the clerical life, who are obligated to attend them, that they may impart their knowledge to their parishioners. A regular journal is kept of the proceedings of the establishment, and which is open to the inspection of every one.

The Patriotic Apiarian Society of Bavaria is a most laudable institution, and its laws ought to be translated into the language of every country where Bees are known. It is not permitted for a peasant to have his own apiary, but a particular favourable spot is pointed out by the society, in which the different proprietors deposit their hives. This place is under the management of a skilful apiarian appointed by the society, and it is ordained that no more than 150 hives shall be kept in one place; each establishment must be four miles distant. A trifling tax is levied upon each hive not belonging to the society; and thus the peasant looks forward at the end of the year to a certain profit, with a very trifling out-going, and without any demand upon his time or labour. Should a poor peasant wish to become the proprietor of a hive or hives, he applies to the society, who immediately comply with his wishes, and an annual deduction is made

from the profits until the society is repaid the value of the hives which it bestowed.

In many parts of Germany, the peasants receive from the government a florin for every hive which they rear in the season, and to prevent them killing the Bees, the florin is not paid until the spring, when the proprietor would not find his advantage in killing them.

On turning my attention to this country, what encouragement is given to the cultivation of the Bee by the government? it appears totally unworthy of its consideration, although the country is annually drained of a very large sum of money for two commodities, which with proper encouragement might be obtained from our own resources. As the government therefore neglects this important branch of commerce, it can only be brought to any degree of perfection by the patriotic exertions of individuals. To effect this purpose, one thing is indispensably requisite, which is, that the number of persons who keep Bees should be increased in the kingdom, and that the most simple method of managing them should be imparted to them. If there be no more hives than what we now see, no rational hope can be formed of obtaining abundance of either wax or honey: but by increasing considerably the proprietors of Bees and the number of hives, the quantity of those two commodities would be immense, and also without incommoding in the slightest degree the proprietors, because every one would only maintain that number, which his garden, his capital, or business would permit him. Some miracle however, I fear must be performed before this desirable end can be effected. It could be soon

accomplished by the rulers of the country, by granting exemptions to one, and rewards to another. The golden ears of corn, which Henry IV. of France, distributed to his subjects, who distinguished themselves in the science of agriculture, soon gave a new face to the country, and shew the wisdom of the monarch.

Without previous instruction, or consulting the most esteemed authors on the subject, I would not advise any one to commence apiarian, and it is in acting contrary to this advice, that the culture of the Bee has declined: for of what use is it to multiply the number of Bee-proprietors, and that these persons, at a considerable expence shall augment the number of their hives, if from an ignorance in their management, without a knowledge of their wants, or the accidents to which they are liable, and the method of remedying them, a great part of the hives die in the winter. Of what use is the multiplication of hives, if from a want of an easy and simple method of extracting the profit from our labours without risking the lives of the Bees, and without exposing the hives, thus deprivated, to an evident loss during the following winters, we are obliged to kill them voluntarily, in order to obtain their provisions? Can we reckon upon any number of hives, or can we hope to obtain a regular supply of wax and honey, if the present method of governing Bees be not altered?

But before the system, which is now acted upon, be changed, it will be necessary to impress on the minds of the country people the great advantages to be derived from the culture of the Bee, and then to impart to them the most simple method of performing the necessary operations. One of the principal causes

of the decline of the culture of the Bee in this country, arises from a total want of encouragement, and a truly gothic ignorance on every point connected with it, it is a natural consequence, that the principal and indeed only method of exciting the country people to apply themselves seriously to the management of Bees, is to present them with that sort of hive which is not of great expence, which offers to them an easy, simple, and commodious method of management, and which embraces every part of their economy; by which means the poorest cultivator being able to reckon, as much as possible, on the life and preservation of his hives, by means of that new method, may also hope with great probability to see his labour and pains rewarded.

As the difficulty of collecting and extracting the wax obliges many proprietors to destroy their hives, it also contributes not a little to disgust the country people, and generally speaking, to render them careless of the prosperity of the Bees; it becomes therefore necessary that a new system of management should furnish an easy and simple method of deprivating the hives without losing many Bees, and without giving much trouble to the proprietor; every object would then be obtained, for to pretend to invent any system by which not a single Bee shall be lost, nor the operator be in the least incommoded by them, would be tantamount to the capture of a city, in order to seize upon the effects of the citizens, without the sword being drawn on either side.

The great mortality which often happens suddenly in a hive, and which destroys the best peopled apiaries, is the principal cause which commonly discou-

rages persons to persevere in the cultivation of the Bee. In the method which is to be adopted, an easy and simple manner must be found of discovering the cause of that mortality, and of applying either a preventive or a remedy, from which, even if the loss be not prevented, at least the general destruction may be avoided, of twenty or thirty hives at a time, for it cannot be expected that any method can be found of wholly preventing the mortality, unless by some means the immortality of the Bee could be established.

I regret to be under the necessity of mentioning another circumstance which tends very much to discourage the culture of the Bee in this country. In an art which embraces so many operations, it can scarcely be expected that an intuitive knowledge can exist. A person desirous of being versed in it, is therefore obliged to have recourse either to verbal instruction or to the perusal of those authors who have written on the subject. In regard to the first, where a general ignorance prevails amongst those, from whom instruction might be supposed to emanate, it cannot be supposed that any progress can be made, and in regard to the latter, who is there that has not visited the cottages of the lower classes, and has not deplored the total want of all education? If the most excellent treatise which ever appeared, were to be placed in the hands of the cottager, and from which he would discover not only the most approved method of managing Bees, but also would discern that his interest was particularly connected with their cultivation, it would remain in his hands, like the diamond in those of the savage. Unable to read, and having no person in the vicinity who could give him the requisite

information on any particular accident or natural occurrence which may have taken place amongst his hives, the destruction of them perhaps ensues, and he is for ever afterwards discouraged from undertaking the management of Bees. I will suppose another case; it cannot be doubted that there are many individuals who have a particular attachment to the management of an apiary, but the question here to be considered is, whether the system followed by those individuals is proper and advantageous.—I do not hesitate to affirm, that the system at present followed by nine-tenths of the keepers of Bees is built on error, and antiquated prejudices. How are that error and those prejudices to be obviated and annulled? Accustomed from the earliest period to tread in a beaten track, the cottager will not turn into a different one, unless a very powerful example is set before him, and he sees a greater advantage resulting from the adoption of the new system than continuing in the old one. I have universally found the lower classes of people averse to all instruction in the management of their Bees; their fathers, grandfathers, and so on up to Noah, followed this or that method, and therefore it must be good. All innovation is dangerous, and considered as infringing the sanctity of antiquated custom.

Should chance place in their immediate neighbourhood a scientific and intelligent man, who is willing to diffuse the knowledge which he has gained, and who can place before their eyes the immediate beneficial consequences resulting from the adoption of a different method than is at present pursued, some hope might be entertained of the culture of the Bee becoming more general; but then he must not pretend

to instruct them.—Conviction must flow of itself, and then, and then only will it be productive of good.

The establishment of an apiarian society was a few years ago suggested by myself, and a meeting was held for the purpose: some spirited individuals stepped forth, willing to second my exertions, and the foundation stone of the society was laid; the superstructure was however never completed, owing to the want of support from a high quarter, which was promised, but never granted.

The particulars of the plan will be transmitted to any gentleman who may be willing to second the intentions of the author in the formation of a society. He renounces all profit and advantage to himself, his sole motive being an extension of the culture of the Bee, which opens such an inexhaustible source of emolument to those engaged in it, and in a natural and commercial point of view, is not to be surpassed.

CHAP. XXXII.

MANUFACTURE OF MEAD.

MEAD is a beverage prepared of water and honey. There are three distinct sorts of it, the simple, the compound, and the vinous. Simple mead is made of water and honey, which does not undergo fermentation. The compound mead is mixed with fruits, essences, &c. in order to give it a different flavour.

The vinous is made of honey and water, which is subject to fermentation. Simple mead is made by boiling three parts of water, in which one part of honey has been dissolved; the quantity of honey may be augmented or diminished according to the taste of the persons who use it. It must be boiled over a moderate fire to two-thirds of the quantity; the liquor is skimmed and poured into a barrel, and particular care must be taken that it is full; it is allowed to subside for three or four days, when it may be drawn off for use. This sort of mead may be made more or less generous, according to the quantity of honey given to it; it is an excellent stomachic. In coughs it excites expectoration, and is gently laxative.

As an economical apiarian will not allow any part of his produce to be wasted, the linens which have been used for filtering the honey should be rinsed in the water destined for the mead. If the linen has been well saturated with the honey, the strength of the mead will be considerably increased.

To make the compound mead, the following instructions must be observed. During the time that the quantity of honey and water, which has been indicated above for the preparation of the simple mead, is boiling, some raisins, cut in two, must be boiled at the same time, allowing half a pound of raisins to six pounds of honey, and four pints of water are necessary to boil them properly. The liquor being diminished one-half, it is strained through a linen, slightly squeezing the raisins; it is then mixed with the decoction of honey and water, and the whole is boiled together for a short time; a toasted crust of bread steeped in beer is then put into it, and having taken off the scum, which has formed afresh, the whole is taken off the fire, and allowed to subside. It is gently poured into a barrel, into which has been put an ounce of salt of tartar dissolved in a glass of spirit of wine. Particular care must be taken that the barrel is full. It must then be exposed with the bung out to the influence of the sun, or in a chamber heated by a stove, taking care that the barrel is kept constantly filled until no more froth is emitted. Having filled it for the last time, the bung is fastened, and it is taken into the cellar, where having remained for a few months, it is fit for use.

To render it more agreeable, five or six drops of the essence of cinnamon may be mixed with the spirit of

wine, in which the salt of tartar has been dissolved. Some pieces of lemon peel, or the sirup of gooseberries, cherries, strawberries, or aromatic flowers may be mixed with it, according to the palate of the fabricator.

This compound mead ferments a considerable time, and is preserved like the other. Care must be taken to rinse with brandy, all the new barrels in which the different kinds of mead are to be preserved.

To make the vinous mead, take one pound of honey to three pints of water. This is the beverage of the majority of the northern people, they call it *miod*. The Russians, for example, compose their mead with honey, cherries, strawberries, gooseberries and mulberries; they commence the fabrication by soaking these fruits for some days in clear water; to which they add some virgin honey, and a piece of bread soaked in beer. The barrels are placed in a room, in which a heat of 18 to 25 degrees is maintained day and night. The fermentation commences at the end of six or eight days, it lasts for about six weeks, and ceases spontaneously. The common people of the same country make mead with honey which is not separated from the wax, and with combs in which the brood still exists, they beat these combs in warm water, leave the liquor to subside, strain it through a bag, boil and drink it.

In the department of Jura in Switzerland, a beverage is made by mixing together every thing which is extracted from the hives, even the brood, after having suffocated the Bees.

I have made an excellent mead according to the following manner.

To thirty pounds of honey, add forty-five bottles of water, the mixture is boiled in a great copper, and when the liquor is reduced to about one half, it is sufficiently boiled. I put two-thirds in a new barrel, well rinced with brandy, and the other third I put into bottles, which I close with fine muslin or coarse linen. If in this state the liquor be tasted, it has an insipid taste, and in order to render it vinous, it must undergo fermentation, which then imparts to it all the fumes of wine, and from which brandy, &c. can be made.

In order to destroy more readily the honey taste of this beverage, chalk, charcoal, and white of eggs must be added in the following manner.

The honey, the water, and the chalk are put into a copper vessel, the size of which should be one-third larger than the volume of the mixture, and the whole must be boiled for two minutes. The charcoal is then put into the liquor, it is well mixed with a spoon, and the boiling is continued for two minutes more, after which the white of eggs is added, and the whole is then mixed with the same care as the charcoal, and it is again boiled for about two minutes; the vessel is then taken from the fire, the liquor is left to cool, and it is then strained through a sieve or flannel; the honey is thus deprived of its particular taste.

To excite fermentation, the liquor must be exposed to heat. Two methods are practised for this purpose. The first is to place the liquor in a stove or the corner of a chimney, in which a constant fire is kept; some bottles are filled with the same liquor.

In about seven or eight days the liquor emits a thick and dirty froth, which leaves a vacuum in the barrel, which must be filled up from the bottles, which are also in a state of fermentation; the fermentation lasts for about two months, and ceases of itself.

The other method is to expose the liquor to the sun, but in this case it must be done in the month of June, and left exposed until the fermentation ceases, which takes place in about three or four months. On placing the barrel in the warmest situation, it must be raised a little from the ground, and attention must be paid to the Bees, and other insects attracted by the odour. During the heat of the day the liquor swells, the froth rises by the bung-hole, and runs down on each side of the barrel. Instead therefore of placing the barrel exactly horizontal, I give it a slight inclination, taking the bunghole as the parallel. As soon as the sun sets or is obscured, the volume of the liquor diminishes, and the barrel has no longer the appearance of being full. In the first case the Bees will lick up, without danger to themselves, the liquid which has flowed from the barrel; but in the second, the bunghole must be closed with a plate of lead, pierced in holes; without this precaution, the Bees would drown themselves. The plate of lead must be taken off when the liquor begins to froth, and when the barrel is no longer full enough to throw off the froth, it must be filled up from the bottles.

The fermentation having ceased, the barrel is put into the cellar, taking due precautions that it is full. After two or three years, it may be put in bottles which must be well corked. They must be allowed to stand one month, to see if they do not burst. They

may then be ranged in bins like other wines. Its taste much resembles that of Malaga; it is a great cordial, dissipates flatulency, and assists perspiration. It must however be drank with moderation, as it is of a very intoxicating quality, and the intoxication caused by it, lasts for a long time. The natives of Poland and Lithuania, whose principal beverage is mead, communicate a very agreeable odour to it, by putting into the barrels a certain quantity of dried elder flowers.—Medicinal qualities may be given to mead, by mixing with it the juice of different plants.

The Grecians put into their wine the flour of *Sesame** kneaded with the honey of mount Hymettus. By this method they made their wines delicious.

The moderns by means of mead imitate the choicest wines, and in Paris the consumption is very considerable. The wines of Malaga, Rota, Muscat, Constantia, and others, are all imitated by mead, and it is fortunate that the beverage is not rendered unwholesome by the imposition. It is discovered very easily by the following process. Take a small glass decanter, and pour into it the wine which you wish to consume, stop the entrance of the bottle with your thumb, and turning the bottle topsy-turvy, dip it into water; then draw away your thumb; if the wine be genuine it will remain in the bottle, being lighter than water, if spurious, the honey will precipitate visibly into the water, which will become immediately cloudy; that which remains in the bottle will be a water, insipid and disagreeable to the taste.

* *Sesame.* A species of corn, according to Pliny; but according to Columella, a species of pulse.

Most excellent vinegar may be made from honey: half a pound of honey must be put to a pint of water, and the honey must be well dissolved. This mixture is then exposed to the greatest heat of the sun; without closing wholly the bunghole, which must be merely covered with coarse linen, to prevent the admission of the insects. In about six weeks, this liquor becomes acid, and changes to a very strong vinegar, and of excellent quality.

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Page 4. Line 27, *for* de Montfort *read* Moufet.
41. (Note) Line 2, *for* Reichselen, *read* Reichsedlen.
48. Line 20, *for* the Queen is fecundated, *read* the Queen is not fecundated.
65. Line 9, *for* in, *read* so.
253. Line 6, *for* Bees, *read* Bears.
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321. Head Line, *for* Transportation of Hives, *read* On the Robberies of Bees.
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